Wason
RA431
C86

ASIA

COURSE *of* HYGIENE

for the use of Hongkong Schools

THIRD EDITION

HONGKONG
NORONHA & CO., GOVERNMENT PRINTERS
1914

Cornell University Library
Ithaca, New York

CHARLES WILLIAM WASON
COLLECTION
CHINA AND THE CHINESE

THE GIFT OF
CHARLES WILLIAM WASON
CLASS OF 1876
1918

Cornell University Library
RA 431.C86

Course of hygiene for the use of Hongkon

3 1924 024 019 378

was

Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924024019378

COURSE *of* HYGIENE

for the use of Hongkong
Schools

THIRD EDITION

Chas. W. Fraser
2/22/17

HONGKONG
NORONHA & CO., GOVERNMENT PRINTERS
1914

PREFACE

The first part of each Chapter is intended to form the basis for instruction to elementary classes to be supplemented by such further instruction as the teacher thinks necessary.

The second part embodies notes and references to guide the reading of students in more advanced classes.

COURSE OF HYGIENE

CHAPTER I.

AIR.

ELEMENTARY COURSE.

The air or atmosphere which surrounds the earth is a mixture of different gases. The most important of these gases are Oxygen, Nitrogen, and Carbonic Acid Gas. The proportions in which they occur in the air are approximately as follows:—Oxygen nearly 21 parts, Nitrogen 79 parts, and Carbonic Acid Gas .03 to .04 part, in 100 parts by volume of air.

Oxygen.—This is the gas which supports life by the process of breathing. If an animal were placed in a vessel of air from which the oxygen had been extracted the animal would quickly die. This gas also is necessary to support combustion. A lighted candle would immediately go out if it were placed in an atmosphere deprived of oxygen.

Nitrogen.—This is the most abundant gas in the air. It does not support life through the process of breathing, nor will it support combustion. Its part in the atmosphere is to dilute the oxygen as water does wine or spirits.

Carbonic Acid Gas.—This gas though present in very small quantities is very important. It is one of the products of respiration and of combustion. All animals breathe out a certain quantity of this gas and the burning of anything such as wood, coal, oil, candles, etc., increases the amount of this gas. The oxygen which is used up in the process of breathing is replaced by this gas.

Carbonic acid gas will not support life or combustion. On the contrary if the gas produced by the breathing of people and the burning of lamps in a room is not sufficiently removed by ventilation, the gas will soon exert a poisonous effect on the people in the room.

It will be seen from these remarks that the amount of this gas in the air cannot be the same everywhere. Naturally the air of crowded houses and of cities contains more of this gas than does the air of the open country or at sea. The air of the open country, of mountainous regions and at sea is much fresher and purer than the air of cities, which explains the great benefit felt by persons who go from cities into such places for a " change of air ".

Since every living animal and every fire which is lit is always adding carbonic acid gas to the air and taking away oxygen, how is it that the oxygen does not get all used up and its place taken by this carbonic acid gas, so that ultimately all men and animals would die for the want of oxygen ? The answer is this. While animals breathe in oxygen from the air and give out carbonic acid gas, plants on the other hand live partly upon the carbonic acid gas. By the help of the green leaves in the daylight plants absorb this gas and give out oxygen to the air. We see therefore that plants are always purifying the air which is rendered impure by animals and men, and that therefore life can continue in the world.

Ventilation.—We have seen that animals in breathing, and fires and lights in burning, render the air impure so that the air of a room inhabited by people would soon become poisonous if fresh air were not allowed to come in to replace the impure air. The process of replacing foul air by fresh air is called Ventilation. It is necessary to know how much fresh air is required by each person. It has been found by experiment that each adult requires 1,000 cubic feet of fresh air every twenty minutes in order that the air of the room in which he is may not become too impure from carbonic acid gas given off from his lungs. If a man were placed in a room measuring 10 feet long by 10 feet wide by 10 feet high, *i.e.*, 1,000 cubic feet, the air in the room would after twenty minutes become too impure to be healthy and would have to be changed, that is, it would need changing three times every hour. If the air were more frequently changed in the room a less cubic space would be sufficient. But if the air of a room is changed too quickly there is an uncomfortable draught as when a strong wind blows in through a window. To cause the air to be changed three times each hour is comfortable, and therefore, it is decided that the amount of cubic space required for each adult is 1,000 cubic feet. Therefore a room to hold 10 adults ought to measure 10,000 cubic feet.

The best way to provide for the ventilation, or the change of air in a house, is to build a house with ample windows on all sides so that in whatever direction the wind may be blowing it may get into the house through some open windows. A large number of small windows is better than a small number of large windows, as when the wind is blowing strongly it is sometimes only possible to open a small window, and if there were no small window to open and the wind were too strong to open a big window the house would be deprived of the benefit of the fresh breeze and the rooms would be hot and close. If a house cannot have windows on all sides, it certainly should have them on two sides, namely, the front and the back.

The amount of open space around a house makes a great difference to the ventilation of the house, so does the height of houses in cities. If the streets in front of houses and the yards at the rear are narrow and especially if the houses be high, the air in such places becomes stagnant and, except when a typhoon is blowing, there is very little breeze to be felt in these streets and scarcely any at all in the yards of the houses. The houses therefore cannot be properly ventilated. On this account it is necessary to make laws governing the building of houses in cities. No house should be allowed to be built higher than the width of the street in front, and the open space behind the house forming its yard or garden should always be as wide as the street in front and as large in area as the house itself.

Then houses would be far better ventilated than they are at present and the people living in them would be more healthy.

ADVANCED COURSE.

Air.—Many other gases are present in air, namely, Water Vapour, Ammonia, Sulphuretted Hydrogen, Marsh Gas, Carbon Monoxide and Ozone.

The amount of Water Vapour present in the air has an important bearing on climate and therefore on health. (See under Chapter XX, Willoughby's "Hygiene for Students".)

Carbon Monoxide is produced by the imperfect oxidation of carbon; it is given off sometimes from cast iron stoves and is present in coal gas. It is very poisonous.

Ozone is a modified form of oxygen and is produced in the atmosphere during thunderstorms.

The other gases are due to local circumstances such as the presence of decomposing organic matter, the proximity of chemical manufactories, and marsh land. (See Willoughby's " Hygiene for Students ", Chapter VII.)

Respiration.—A man gives out by breathing about .6 cubic feet of carbonic acid gas (CO_2) per hour or .2 cubic feet in twenty minutes. It is found that as soon as the air of a room contains .6 cubic feet CO_2 per 1,000 of air it begins to be close and unpleasant. The air of towns already contains about .4 per 1,000 volumes of CO_2. Therefore it is seen that the amount .6 vols. per 1,000 is reached in twenty minutes. As this amount .6 per 1,000 is the accepted permissible limit of impurity it follows that each man requires 3,000 cubic feet of fresh air per hour. (See Willoughby's " Hygiene for Students ", Chapter VII.)

The air of an inhabited room becomes close and unhealthy long before the carbonic acid gas present has reached by itself poisonous proportions. This is due to other animal exhalations evolved *pari passu* with the carbonic acid gas. This gas however forms a convenient index to the total impurity of the air, and is so made use of in practice.

Allowance must also be made for the consumption of oxygen by artificial lighting. (See as above.)

Ventilation.—Ventilation may be natural or artificial. The natural ventilation of a room is obtained by taking advantage of the laws governing the movement of the air and of the diffusion of gases.

The movement of air is governed by local differences of temperature and barometric pressure.

By bearing in mind these natural laws it is possible to provide a house with ventilating shafts and openings of suitable shape, size and position to afford the means of escape to the foul air and entry to the fresh air. (See Chapter VIII, Willoughby's "Hygiene for Students".)

Artificial ventilation by which the circulation of air is entirely due to mechanical means is unsuitable for domestic buildings. It is useful under special circumstances, where the character of the building or place to be ventilated does not lend itself to ventilation by the natural system. (See as above.)

CHAPTER II.

WATER AND WATER SUPPLY.

ELEMENTARY COURSE.

Source of Water.—If one exposes a vessel of water to the air, one notices that the water gradually disappears. The warmer and dryer the air the more quickly does the water disappear. This disappearance of the water is due to evaporation. The water passes into the air in the form of gas or vapour.

What one sees every day in the case of small quantities of water exposed to the air is always taking place in nature from the sea and other large bodies of water. The warmth of the sun causes the water to rise in the form of invisible vapour into the air. From this water vapour in the air clouds are formed and from the clouds comes rain. The rain when it falls on the land forms rivers and streams and these flow again to the sea.

All the rain which falls on the land does not run away directly into rivers and streams and so get quickly to the sea again, but some of it sinks into the ground. This is the water which we find when we dig a well. Sometimes the water bubbles out of the ground itself, especially on hillsides and is then called a spring.

Water for Drinking and Domestic Use.—This may be obtained in different ways—by collecting rain, from springs, from wells, and from rivers or streams.

Rain Water.—In the country water is often collected from the roofs of houses and stored in tanks: if the roofs be clean such water may be very good for domestic use as rain water is in country places very pure. In towns roofs are dirty and the air full of dust and smoke so that rain water so collected is not a good source of supply.

Spring Water.—In the country especially, hill springs, away from houses and villages, are excellent sources of water supply.

Wells are the most usual sources of supply in Chinese towns. Sometimes well water is of very good quality, and sometimes it is of a very bad and dangerous quality.

Wells are often rendered dangerous owing to filthy water getting into them. The filthy water may drip into the well through the top of the well or it may drain in through the sides of the well. This filthy water is liable to get into a well when the well is too near a house or village. The refuse and sewage flowing out of houses may find their way into the well especially if there be drains or cesspools near the well. But wells can often be made safe sources of water supply if the following rules are paid strict attention to:—

1. Dig the well in a place at as great a distance from any house as is possible and select a spot where grass and bushes are growing.
2. Be very careful that there are no manure pits, cesspools or foul drains in the neighbourhood of the well especially in any ground higher than the well.
3. Line the well with good brickwork down to the bottom and build a low wall round the top and put a good cover over it.
4. Use a pump to draw up the water so that people will not have to dip dirty buckets into the well for this purpose.

River Water.—Rivers and streams are not often good sources of water for drinking purposes, especially in towns and villages situated, as they nearly always are, on their banks. A great deal of the filth and refuse from a town or village finds its way into the river or stream close at hand and renders the water impure. In the country too, heavy rains are likely to wash manure which has been placed on fields into the rivers.

If a river or stream is the only source of water supply at hand, the proper course is to boil the water before drinking it. This will make the water safe to drink. The practice which the Chinese adopt of drinking tea instead of cold water is a very good one and no doubt saves them from many diseases caused by drinking impure fresh water.

Water Supply Systems.—The above sources of water supply are those usually found in towns and villages in the East. In Western countries and also in those Eastern cities which are governed by Western nations, for example Hongkong, artificial systems of water supply are often met with.

In Hongkong when any one wishes to get water he has only to go to a tap in his house or in the street to obtain the water.

The water is brought into the city in pipes under the ground and from these pipes by smaller ones into the houses, etc. If these pipes be traced back to their beginning it is found that the water comes from a very large reservoir or artificial lake which has been made several miles away from the city. The water in this reservoir is of course obtained from the rain which falling on the land in the neighbourhood runs down the hillsides in streams to fill the reservoir. This reservoir is built far away from houses in order that the water which flows into it may be pure and not contain any of the dirty washings which rain water always carries away with it when it has fallen in the neighbourhood of houses, villages or cities.

When great care is taken to prevent filth finding its way into reservoirs (like the Tytam reservoir in Hongkong) such a water supply as ours is an extremely good one. But even although the water in our big reservoir is very pure, still further precautions are taken to render it safe. This is done by making the water soak slowly through beds of sand whereby the water is purified still more. This process is called filtration and the beds of sand are called sand filters.

After the water has passed through these sand filters it is stored in another reservoir—a small one—from which it is allowed to flow as required into the pipes which come down into the streets of the city.

It is very important that the water pipes in a city should not leak because sometimes dirty matter may get into a pipe at the leaky place.

It is also important that water taps in houses should not be left turned on when as sometimes happens no water is coming through the tap. It is necessary sometimes to turn off the water from the street pipes in order to make repairs or to prevent waste of water during the dry season when water is scarce. When this happens all house taps should be kept closed.

Amount of Water Required.—In a city or in the country water is required for drinking, whether as plain water or as tea, etc., for the cooking of food, for washing and bathing the body, for washing clothes, and for washing and cleansing the houses. In a city in addition water is required for watering and cleansing the streets, for flushing drains, etc., and also for use in manufactories.

For domestic and personal use, that is, for the preparation of food, the washing of the body, clothing and houses, about 15 gallons of water a day are required by each person.

Contamination of Water.—In Hongkong as in most places governed by Western methods the water supplied to the city is very pure. But still sometimes by accident such water supply may be rendered dangerous. The chief source of such danger lies in the possibility of dirt getting into water pipes through leaks.

Another way in which the water may be made impure is owing to the careless storage of water in open barrels or tanks in the yards of houses. The water barrels so often seen in Hongkong are sometimes dirty and generally are not provided with covers and are so placed that dirty matter may get into them from the kitchens of upper floors. Dirty buckets and dippers are sometimes used to take the water out of the barrels. All barrels or tanks for storing water ought to be kept very clean and to be well covered and the water ought to be drawn out by a tap placed a few inches higher than the bottom of the barrel or tank. Some receptacle for storing water is necessary when the water supply from the house taps is turned off, but during the season when water is plentiful and is turned on all day it is safer not to use barrels or tanks at all for storing drinking water.

In Hongkong fish are sometimes put into a water barrel to keep them alive or fresh, this is a bad practice and should never be adopted.

Purification of Water.—The best and only perfectly safe way to ensure the purification of water for drinking purposes is by boiling it. As I have said above, the Chinese practice of drinking tea is an excellent one and saves them from many diseases which are caused by drinking impure water. If it is desired to drink plain water it can be kept after having been boiled, in clean covered jars or bottles.

If the only water which can be obtained is muddy it can be allowed to stand quietly until the mud has sunk to the bottom and the cleaned water can then be carefully poured off and boiled, or the water may be strained through a clean cotton cloth folded several times and then boiled.

ADVANCED COURSE.

Water was once called an elementary body but we know now that it is composed of two elements chemically combined, namely, oxygen and hydrogen in the proportion of 1 volume of oxygen to 2 volumes of hydrogen and that its formula is therefore H_2O.

Absolutely pure water does not exist in nature. Water is capable of dissolving so many substances that no natural water can be obtained that does not contain other bodies in solution. Even rain water falling far from any town will contain gases derived from the atmosphere through which it has fallen.

But it is a common practice to speak of pure and impure waters and in Hygiene when a pure water is mentioned it is meant that such a water is fit for all domestic purposes.

Hard and Soft Water.—Water is called a soft water if it is capable of easily producing a lather when used with soap, and conversely it is called hard if such a lather is produced only on using a much larger quantity of soap than is needed for a soft water. Yet both hard and soft waters, provided that the hardness is what is called Temporary Hardness and is not excessive, are equally fit for drinking and cooking purposes.

Causes of Hardness.—This property of hard water in relation to soap is due chiefly to the presence of certain salts in the water, namely, the carbonates of lime (chalk) and magnesia, and the sulphates and chlorides of lime and magnesia.

The carbonates are held in solution by the water owing to the presence in the water of carbonic acid gas CO_2. If such a water be boiled this gas is driven off and the carbonates are then thrown out of solution and so the water is softened. Hardness due to this cause is called Temporary Hardness.

If the water contains the sulphates above mentioned it will not be softened by boiling, and hardness due to such salts is called Permanent Hardness.

For drinking purposes a water should not contain more than 4 grains of such sulphates in a gallon and the total amount of these salts causing hardness, both permanent and temporary, should not exceed 20 grains per gallon.

Hard waters are undesirable for manufacturing purposes as they cause boiler incrustation.

Besides being softened by boiling a temporarily hard water may be softened by adding milk of lime to it. This is sometimes done on a large scale for softening a town water supply. (See Willoughby's "Hygiene for Students", Chapter XI, pages 265-269.)

Action of Water on Lead.—Lead is a dangerous poison even in small quantities and as lead is a metal often used for making pipes and cisterns it is very important to know how water may dissolve lead and so cause poisoning in those drinking the water.

A mere trace of lead in drinking water should condemn it and anything over one-twentieth of a grain per gallon may be looked on as certainly injurious. Lead should never be used for pipes or cisterns for drinking water.

All waters do not equally act on lead. Soft waters act on lead more than hard waters. Water derived from moorland streams is sometimes slightly acid and will act rapidly on lead.

Hard waters will deposit on the insides of lead pipes a thin film or crust of insoluble matter and so protect the water from the lead. It is however inadvisable to trust to this and as said above lead pipes or cisterns should never be used for drinking water. (See Willoughby, Chapter XII, pages 307-308.)

Sources of Water.—In the Elementary portion of this Chapter, a description of the sources of water supply has been given but in dealing with wells only one kind has been considered, that is, the shallow well which is the only form of well known to an Eastern or rural population.

There are however other forms of wells, *viz.*, Deep and Artesian Wells.

The three forms of wells are therefore :—

(1.) Shallow or superficial wells sunk in the soil to tap the ground or subsoil water but not carried down below the first layer of impervious material on which such subsoil water rests.

(2.) Deep wells which penetrate the impervious layer on which the ground or subsoil water rests and reach a water bearing stratum below this.

(3.) Artesian wells in which the water overflows the top of the well in a continuous stream once the deep water bearing stratum is reached by the boring or digging of the well.

For detailed description of sources of water, read Willoughby's "Hygiene for Students", Chapter XI, pages 269-280.

Contamination of Wells.—Besides the possibility of contamination of shallow wells improperly constructed or situated too near to drains or cesspools, deep wells may be contaminated owing to there being fissures or cracks in the rocks through which such wells are bored. Sewage or filthy water from leaky cesspools or drains may pass for great distances through such fissures and contaminate the deep wells.

Again the water reached by deep well may be so highly charged with mineral matter as to be unfit for drinking purposes and may resemble in character the water derived from so called mineral springs some of which are great value for medicinal purposes.

Water Service.—There are two recognised systems of supplying water to houses by means of water pipes, namely, the Constant and Intermittent Systems. The Constant System is the best as it does away with the necessity for domestic tanks and cisterns which are liable to be neglected and to become foul. For details of these systems see Willoughby on Constant and Intermittent Supply, Chapter XII, pages 304 to 307, and on Position and Fittings of Cisterns and Service Pipes, pages 309 to 311.

Filters.—There is great misconception of the value of filters. Numerous domestic filters are advertised. Some are worse than others and there is only one type which can be recommended. This is the Pasteur Chamberland type. Even this filter is useless except in the hands of persons who know how to use and clean it and who will take the trouble to clean it. A family is therefore far better off without a filter than with one. If there be any doubt as to the purity of the supply of drinking water it is advisable to boil it before drinking. (See Willoughby's " Hygiene for Students ", Chapter XII, pages 311-317.)

CHAPTER III.

FOOD AND FOOD SUPPLY.

ELEMENTARY COURSE.

All living things whether animals or plants require food in order to live.

Plants derive their food from the soil and from the air. When a garden is manured the earth or soil of the garden soon alters the manure so that plants growing in the garden can take up by their roots for food the materials which are formed in the earth out of the manure. The portion of food for plants which the air contains is the carbonic acid gas which has been mentioned in Chapter I. This gas is by the action of the green leaves of plants in the daylight so acted on that the carbon it contains is taken in by the plants' leaves and the oxygen returned to the air.

Animals obtain their food from plants. Those animals which do not eat the flesh of other animals but only feed on plants are called herbivorous ; examples of these are the ox, horse and sheep. Some animals such as lions, tigers and cats in the wild state live entirely on the flesh of other animals which they prey on. Such animals as these are called carnivorous animals.

Other animals, among which is man, live on plants and animals as food. But although the flesh of other animals is eaten by some animals yet the animals which are eaten get their food directly or indirectly from plants and therefore we see that without plants there could be no animal life.

Men as we know eat both vegetable food and animal food. In other words their diet is said to be a mixed diet.

For our food we require three chief different things, namely, starchy matter, oily matter or fat, and substances derived from flesh called albumens or albuminous matter.

The starchy matter is obtained from plants. Such foods as rice, flour and potatoes contain a lot of starch. Sugar is also a food obtained from plants and is very much like starch in composition although different in taste. Sugar is a very useful food, but is not eaten generally in such large quantities as starch.

Oily matter and fats are obtained both from plants and animals. Olive oil and cocoanut oil are examples of oil obtained from plants while butter, lard and suet are examples of fats or oils obtained from animals.

The albuminous matter is chiefly derived from animal food such as the flesh of oxen, sheep, pigs, fresh eggs, etc. A good example of albumen is the " white " of an egg. It is possible to obtain albumen from plants; for example peas and beans supply a great deal of albuminous matter. In this form however the albumen is not so easily digested as when it is taken in the form of animal food.

Many Eastern races however do almost entirely depend on this kind of vegetable for their albuminous matter. Wheat, oats and maize or Indian corn also contain a fair quantity of albumen and therefore those people who use these foods largely can manage with less animal food than those who chiefly eat rice which contains only a little albumen.

From the above remarks it will be seen that the customary food of the Chinese, namely, rice, fish and pork fat and lean, will supply the three necessary parts of food. The rice will supply the starch and a litle albumen, the fish and the lean part of pork will supply the albumen, and the fat of the pork will supply the necessary fat or oil.

Of these three things the starch is required in greatest quantity, then comes the albumen and then the fat or oil next in order.

In addition to these three chief foods there is another kind, called salts, which is necessary in small quantities. Ordinary salt used in cooking is required to keep the body in health. There are however other kinds of salt and these are obtained by eating fresh vegetables and fruits. These things are also necessary for the health of the body.

There is one very important food which must be considered, namely, milk.

Milk is the proper food for infants and it should be the milk of the infant's mother. Pure cow's milk which is sometimes given to infants is too strong for them and has to be mixed with water and a little sugar before it is suitable for infants.

On no account whatever should starchy food, that is, food made of rice or flour of any kind be given to infants until they are at least eight months old. It is a common practice in China to give infants rice cakes and other articles of food, which are only fit for much older children, almost directly after they are born. This frequently causes illness amongst children and is the cause of the death of enormous numbers of children in China.

Children should not be allowed to eat the ordinary food of adults until they have got enough teeth to bite and chew the food, as, if solid food is swallowed without being well chewed it will cause illness.

Cooking.—Man is the only animal which cooks food before eating it. It is not absolutely necessary for men to cook their food before eating it. Men eat the grains, and flour made from the grains of plants, such as rice, oats, corn, fresh fruit and vegetables and such things as milk, eggs and cheese without cooking them. But cooking if done properly makes food more digestible and pleasant to the taste. It is also most useful because it helps to keep food from turning bad. In dealing with water (Chapter II) I pointed out that the boiling of water often prevents disease arising from drinking impure water. The cooking of food acts in the same way.

Animals suffer from some diseases which might spread to men eating the flesh of the animals without it being well cooked. And meat which has come from quite healthy animals may sometimes be unfit to eat after it has been kept for a little time although it does not look bad.

The same thing may happen in the case of other foods than flesh.

The reason of this is that very minute plants, so small as to be quite invisible except with a microscope, may grow in food and make it poisonous.

If these small plants grow in the food for a few days they often cause it to change in colour and smell so that it is easy to see that the food is bad and unfit to eat, but if they have only grown on the food for a very short time the food may look quite good. The cooking of the food kills these small plants and so the food is then safer to eat and will keep good for a longer time. Of course any food which looks or smells bad should never be eaten. In hot weather food goes bad in this way more quickly than in cold weather.

Food will of course go bad after it has been cooked if kept too long and therefore it is unwise to keep food which has been cooked on one day to be eaten on the next.

Food whether raw or cooked ought never to be exposed in a place where such vermin as rats, mice, cockroaches or flies can touch it.

Every householder ought to have a " safe " in which to keep his food for the day. This " safe " is usually made of a wooden frame and bottom with wire netting for the sides and the tops to keep out even small flies, but to allow fresh air to enter.

This is very important as the vermin may carry to the food the poisons which cause such diseases as Cholera and Typhoid Fever.

The reason for this is that persons sick from these diseases discharge from their bodies the poisons of these diseases in enormous quantities. These discharges may get about the house and especially the kitchen if the nightsoil pots are kept in the kitchen. Vermin may therefore after running over or settling upon these discharges, like flies do, get to the exposed food and so poison it.

Kitchens where food is kept and all utensils used for keeping or cooking food should be therefore kept very clean, and vermin should be kept out of the house as much as possible in order that the food may be wholesome.

Errors in diet and drug taking.—Although drugs are not strictly speaking foods, yet it is best in this chapter to consider the question of the eating and drinking or otherwise administrating certain substances such as alcohol, opium, cocaine, etc.

With regard to alcohol, although it is not classed as a food, it is contained in some beverages which are foods in virtue of the other substances which they contain. For example, sweet wines contain sugar, and beer contains sugar and substances allied to starch. Other alcoholic beverages however may contain practically nothing of any food value but the solutions more or less strong of alcohol.

Such substances as opium, morphine, alcohol and cocaine are simply drugs. The important point to remember in connection with these substances is that while they are very useful as medicines, and in the case of alcoholic drinks, if of good quality and of a suitable kind, and taken in strict moderation, they need not necessarily be harmful to every person, yet people are very liable to acquire the habit of taking them to such a degree that they can not leave them off. Such a person then becomes a slave to the habit, takes increasing amounts, seriously undermines his health and becomes incapable of attending to his business or duties, is untrustworthy and so frequently involves himself and his family in misery and ruin.

Great efforts are being made just now by the Chinese to eradicate the opium-smoking habit from their people. Watchfulness is needed that this habit is not replaced by that of alcohol, morphine or cocaine. The substitution for opium-smoking of either of these drug habits would produce a worse state of affairs than before. It will be well now to consider in more detail some of the more important of these substances.

Alcohol.

This is the substance which gives to all such beverages as wines, spirits, beer, etc., their stimulating effect. The amount of alcohol contained in the various beverages varies greatly with the kind of beverage, for example, in the so-called light wines of Europe the alcohol content may be as low as five per cent. Stronger wines may contain as much as twenty per cent. of alcohol.

Spirits such as Brandy and Whiskey usually contain from forty to fifty per cent. of alcohol and in the case of Rum and Absinthe the amount may reach nearly eighty per cent.

Alcohol is intoxicating, that is, it is poisonous if taken in any but very moderate amounts. On this account all alcohol containing drinks are classed as intoxicating liquors.

Almost all nations make use of alcoholic beverages, the liking which people have for them being due to the stimulating effect on the body which they produce.

Their great danger consists in the fact that people usually take more of them than they can without harming themselves.

When people take alcohol habitually the amount needed to produce the stimulating effect continually increases and the harm done to the body increases in proportion.

The effect of alcohol in producing such a feeling of stimulation may be compared to the effect of stirring a fire without adding more fuel. The fire burns more brightly for a while, but more rapidly dies out. So will the taking of alcohol leave a person tired and ill after the stimulating effect has passed off, should the amount consumed have been too much. The stimulation of a small amount of alcohol rapidly passes into that of intoxication and poisoning as the amount consumed increases.

Herein lies a great danger. More alcohol is taken with the idea of recovering from the poisonous effect of a previous dose and so the alcohol habit is acquired.

Alcohol is a very insidious poison. Besides the immediate effect of an overdose, there occurs a slow but sure change in the body, interfering with the proper functions of the various organs. Thus the brain and nerves are gradually injured, as also are the organs of digestion and the heart and blood vessels.

In this way the alcohol habit impairs a man's mental faculties and shortens life.

Alcohol is particularly dangerous to children and to young people. It is no doubt a useful medicine, but it is not too much to say that it is never needed by a healthy person.

Besides the evils which come from continued indulgence in alcoholic drinks there is another aspect of alcoholic poisoning, namely, the result of taking an excessive amount in a short time. Symptoms of acute poisoning occur, the affected person becomes temporarily insane, is very violent and has delirium of a horrible nature. This condition is popularly known as " The Horrors ". Death in the midst of such an attack is very liable to occur.

Opium and Morphine.—These two substances may be considered together as the effect of opium is chiefly due to the fact that it contains morphine. In fact morphine is obtained from opium by certain chemical processes.

These drugs are among those classed as Narcotics from the fact that they can produce a condition of stupor or mental insensibility. They are strong poisons and will rapidly destroy life if taken in sufficient quantity.

We are here however concerned with the question of the opium or morphine habit, that is, the custom of taking these drugs for the sake of the peculiar effect they produce when taken in doses which stop short of causing immediate death.

It is easy to acquire a liking for the effect of these drugs and such liking very frequently progresses to a positive craving for them.

As in the case of alcohol there is always a tendency to increase the amounts taken and the victim of the habit suffers from a chronic poisoning.

A confirmed opium or morphine taker becomes a mental and physical wreck. Opium may be taken in various ways, in the form of pills, as a liquid prepared from it, or in a specially prepared form it may be smoked.

Morphine is usually taken by being injected below the skin. But in whatever way these drugs are taken their effect on the body is ultimately the same.

The injection of morphine is perhaps the most to be feared as its effects are more rapid and the method more secret.

To children opium or morphine are deadly poisons, and no adult should ever take any substance containing or prepared from opium or morphine except as a medicine and strictly under a doctor's advice.

Chloral.—This is a substance which is used in suitable cases by doctors to produce sleep. It is, however, a very dangerous drug in the hands of those who take it without or contrary to medical advice.

Like opium and alcohol, chloral numbers its victims who have acquired the habit of taking it, and like those poisons this also seriously undermines and destroys the health of its victims.

Cocaine.—This substance is also a drug which is of great service in the practice of medicine, and unfortunately, like alcohol opium and morphine it has its victims who have acquired the cocaine habit.

The drug is taken for its transitory stimulating effect, and usually, as is the case with morphine, by the method of injection .

The habit of taking cocaine is speedily acquired and the doses rapidly increased. It is even more difficult for a victim of the cocaine habit to leave off the drug than in the case of a morphine victim and the effect on the victim is even worse, his mental faculties rapidly deteriorate and his body becomes a physical wreck.

ADVANCED COURSE.

Classification of Food.—The popular division of foods into animal and vegetable is not sufficiently accurate for the purposes of Hygiene. A more scientific classification is into Albuminates, Fats and Carbohydrates.

Examples of these are seen in the following types of foods :—

1. *Albuminates.*—White of egg and lean meat, etc.
2. *Fats.*—Butter, lard, olive oil, etc.
3. *Carbohydrates.*—Sugar, starch, etc.

For details of the different kinds of foods grouped under these headings see Willoughby's "Hygiene for Students", Chapter I, pages 3-11.

Uses of Food.—Food is required for two purposes, namely :—

1. The repair of the body tissues necessary on account of their daily wear and tear.
2. The production of energy which is shewn in the heat of the body and its capability of doing work.

The different kinds of food require to be taken in different quantities according to the amount of work done by the body. Further these different kinds of food must be taken in certain definite proportions.

The following table shows the amount of food stuffs required by a man under different conditions of rest and work :—

	Albuminates.	*Fats.*	*Carbohydrates.*	*Salts.*
Rest, ...	3 ozs.	1½ ozs.	12 ozs.	1 oz.
Moderate work,...	4½ "	3 "	15 "	1¼ "
Hard work,........	6 "	4½ "	18 "	1½ "

The above amounts are approximate and are water free, *i.e.*, nothing is allowed for the water which is always present in fresh foods. In practice these amounts of food if obtained from ordinary foodstuffs would contain about their own weight of water. Thus a diet for moderate work would be about 45 ozs. or nearly 3 lbs. of solid food.

In addition to this an average of about 60 ozs. of water is taken as a beverage daily and about the same quantity mixed with the solid food in the form of soups and broths.

For the uses of food and the quantities of each kind required under different conditions, see Willoughby's "Hygiene for Students", Chapter I, pages 12-23.

CHAPTER IV.

CLOTHING.

ELEMENTARY COURSE.

The body of a healthy man always remains at the same temperature whatever be the temperature of the surrounding air. Every one, however, knows how much harder it is to keep comfortably warm in cold weather than in warm weather, and how easy it is to get uncomfortably hot in the hot weather.

Men are sometimes doing hard bodily work or taking exercise, sometimes sitting in a house, and sometimes standing or slowly walking out of doors. Again a man is sometimes exposed to sudden changes of temperature due to change in the wind, rain and sunshine. The body has to adapt itself to these changes and it is to help the body to do this that we wear clothes. In cold weather we require clothes which will keep the natural heat of the body from being lost into the cold air, and in hot weather, especially when we are exposed to the rays of the sun, we require clothes which will keep out the heat of the air or sunshine from our skins.

Now the skin is always giving off moisture. When hard work is being done this moisture is visible and is called sweat, but when we are not sweating we are still giving off some moisture from our skins. This moisture generally evaporates or disappears into the air and in doing so keeps us cool. If it does not, but clings to the body we feel very uncomfortable.

This happens in the hot damp weather when there is so much moisture already in the air that the moisture given off from our bodies can only escape into the air with difficulty. The thicker the clothes we wear the more difficult it is for this moisture to escape, but in cold weather when we do not sweat this does not cause discomfort.

From the above it will be seen that in cold weather we must wear thicker clothes to keep in the heat of the body, and that in the summer we must wear clothes which will allow the increased moisture of the skin to evaporate into the air. Summer clothes must therefore be thin but not so thin that they will not protect the skin from the rays of the sun.

Materials for Clothing.—Besides the question of thickness of clothing there is the matter of the kind of material from which the clothing is made. Some clothing is made from products of plants and some from animals. For example cotton and linen are made from plants, while wool, silk, and furs are obtained from animals.

Cotton and woollen clothes have not the same effect on the heat of the body. Cotton allows the heat of the body to escape more easily than does wool, and also will allow outside heat to penetrate to the skin more easily than will wool. Therefore cotton clothing is not so healthy as is woollen clothing.

Woollen clothing is able to take up moisture from the body like a sponge and so is more comfortable and healthy than cotton clothing which soon gets soaked through with sweat and is then cold and uncomfortable. Woollen clothes are therefore by far the best both in summer and winter. It can be worn thick in the cold weather and fitted snugly to the body and in the summer it can be worn very thin and loose.

Silk is very similar to wool in its properties but is so expensive as to be beyond the reach of most people for underclothing and is chiefly used therefore for the making of very light outer garments and for personal adornment.

There is however a method by which cotton may be made equal to wool for keeping in the heat of the body, namely, by wearing clothes padded with cotton wool or unspun cotton. Such clothing, which is largely used by the Chinese in cold weather, is excellent for warmth but has the following drawbacks: it will not absorb moisture and remain comfortable like woollen clothing will and therefore soon spoils if exercise should have to be taken with consequent sweating of the skin, while being worn; further, it cannot be washed.

Colour of Clothing.—Dark coloured clothes are warmer than light coloured ones and therefore dark clothing is more suitable for cold and light coloured for warm weather.

Besides the uses of clothing described above, it serves to protect the body from mechanical injuries and from the bites of insects and vermin.

Waterproof Clothing.—This kind of clothing is very useful to protect the body from the rain. By putting on a waterproof coat on a rainy day one prevents one's clothes inside from getting wet and can avoid staying in wet clothes and getting chilled. Waterproofs, however, keep the moisture of the body from escaping as well as keeping out the rain, and if worn for long at a time render the body very uncomfortable and are bad for the health. Such clothing should therefore never be used except when necessary.

ADVANCED COURSE.

There is a question of clothing which is very much neglected in practice, namely, that of night clothing including beds and bedding. The object of bed clothes is to keep the body sufficiently warm at night so as to prevent chills. Bed clothes should be as light as possible while affording sufficient means of preventing too much loss of heat from the body during the cool hours of night and at the same time they should allow, as day clothing should, the moisture from the sweat to be absorbed by the clothing. They should also be capable of being frequently washed.

For night clothing therefore silk or woollen materials are far better than cotton or linen both for summer and winter use. One of the most important points is to keep the abdomen warm at night. Flannel belts are useful for this purpose and will be found of great use in preventing " chills " at night leading to diarrhœa.

Stuffed mattresses are not healthy things. They are never washed and are frequently sold and bought again second hand and used by different people year after year. The best form of mattress is the modern wire spring mattress. Over this can be placed 2 or 3 folds or more of washable blankets or other material which will be quite sufficient for warmth and comfort in sleeping. Even a wooden bed with folds of blanket over it for softness is far more desirable than a stuffed mattress.

Above all it must be remembered that all parts of the bed and bedding must be washable.

Errors in Dress.—As dress is used for personal adornment as well as for necessary comfort there is always a tendency in certain classes to sacrifice health for the sake of a smart appearance according to the prevailing fashion.

This shews itself in such things as tight boots which spoil the feet, tight stays and other clothing especially for women whereby the breathing is interfered with and the organs of the chests and abdomen often squeezed out of shape and position. The tight stays in European women and the bound feet of Chinese women are examples of injurious fashions whereby the health suffers.

See Willoughby's "Hygiene for Students", Chapter V, pages 125-130.

CHAPTER V.

HOUSING.

ELEMENTARY COURSE.

Houses are intended primarily to afford protection against exposure to the weather in its changes from day to day and in its seasonal changes, *i.e.*, from the heat of summer to the cold of winter and back again. Unlike most animals, men are able to live in the hottest and coldest countries, but they would not be able to do this if they could not by means of suitable clothing and houses afford themselves a certain protection from the severity of climates. A house therefore should be so built that it will be warmer in very cold weather indoors than the outside air, and in hot weather cooler indoors than outside.

It will be seen therefore that there is a resemblance between the house a man lives in and the clothing he wears for the materials of which a house is built ought to prevent the warmth of the house being lost into the outer air during the cold weather and prevent also the inmates from feeling the heat of the sun too much in the hot weather. Just as this is effected in the case of clothing by the material of which it is made and the thickness and texture of the clothing, so in the case of houses it is effected by the nature of the material of which the house is built, by the thickness of the walls and the careful way in which the house is built.

Besides this regulation of the temperature indoors a house has to afford protection from rain and strong wind and from the dampness of the ground. The walls, the ground surface and the roof of a house must therefore be made of material which will resist the passage of moisture.

In many houses in Hongkong it is found that the ground surface and the walls are nearly always damp in the rainy season. This especially occurs in rooms which are below or partly below the level of the ground outside. Such rooms are damp because the floor and walls absorb moisture from the ground in the same way that a sponge or cloth absorbs water when dipped into it. These damp rooms are not healthy to live in.

Although a house must afford protection from wind and rain and the heat of the sun's rays yet a house must not be so built as to keep out at all times the breeze which by entering the rooms will provide fresh pure air to breathe. Neither must they be built so as to keep in the air which has become hot and impure by the breathing of the people in the house and by the burning of fires and lights in the house. In other words the house must be built so as to be well ventilated.

Ventilation has already been dealt with in Chapter I. Even if a house be built so that it can be properly ventilated, yet if the people living in it are careless and do not open the windows whenever the weather will permit and especially if they allow too many people to crowd into a house, then such a house will be badly ventilated and the people living in it will suffer in health.

Besides the question of the protection from the severity of the weather and the question of ventilation there are other points to be remembered in the building of houses. These are best considered under the following heads, namely, sites, aspect, floors, ceilings, walls, roofs, warming and lighting, provision of kitchens, latrines and the question of sub-dividing houses or floors into cubicles or small sleeping-rooms without windows which has been a common custom in Hongkong.

Sites.—Under this heading we have to consider the position in which the house is built or to be built, the nature of the soil or ground immediately under the house and in its neighbourhood, whether a house in a certain position will be too much exposed to the weather or too much sheltered to obtain proper ventilation, and whether the house is likely to be dry or damp.

The ground on which a house is built ought not to be too damp or in a waterlogged state such as is found often in low lying ground near rivers or streams. The ground around the house also must not be in such a condition. If pools of water can collect on the ground about the house the house will be liable to become damp. Further, mosquitoes will breed in such places and probably cause the inhabitants of the neighbourhood to suffer from fever (*see* Chapter VII, Malaria). When a house is built on the hillside, as frequently happens in Hongkong, it is necessary to prepare the site for the house by cutting away part of the hill so as to obtain a level site for the house. When this is done there should always be a considerable space left between the cutting and the site of the house and no room of the house should have its walls built against the earth. If this is carried out dampness of the house will be largely prevented.

Sometimes a site for a house is made by filling in a hollow in the ground with some material so as to get a level site. If such a hollow were originally a pool of water such a made site would always be damp unless provision were made to allow the water to drain away before filling in the site. Again such a site might be prepared by filling in the hollow with rubbish containing the sweepings from street and refuse collected from houses. A house built on such a site is said to be built on made ground and if the ground contains refuse and filth such a house would be very unhealthy.

Trees in the neighbourhood of houses help to dry the ground and afford shelter from wind but if they are abundant and too close to the houses they check the free ventilation of the houses. A profuse undergrowth of bushes and shrubs close about a house is unhealthy as it tends to harbour mosquitoes. It should therefore be cleared away.

Aspect.—By this is meant the outlook from the house and the ease or difficulty with which it obtains its proper requirements of fresh air, sunshine and light.

These three things are essential for the healthy condition of a house. A house so situated that it gets plenty of fresh air, sunshine and light is always better ventilated, drier and generally cleaner than a house not so well situated and is therefore more healthy.

Floors.—When a house is built so that the lowest rooms are right at the top of the earth or ground, the floors of such rooms must be so made that they will keep out the moisture of the earth from the room and also so made that water spilt on the floor or used to wash the floor will not be absorbed by the floor surface and so render it damp.

Floors made of concrete with a good cement covering are the best. The red tiles which come from Canton and are largely used for such floors in Hongkong are unhealthy, as they will absorb a lot of moisture and keep the floors of houses very damp.

It is also important that ground surfaces should be covered with material which will prevent rats forming their runs under the floor and perhaps even making holes into the rooms through the floor. This is very important especially in countries where plague exists as rats suffer from plague and the disease can be transferred to men from these animals.

It is best whenever possible for the lowest room of a house not to be built right on top of the earth, but to have a space a few feet high between the ground surface, which should be concreted and cemented, and the lowest floor. The space or vault should be properly ventilated and all dampness be excluded from it.

Upper floors in houses are best made of good hardwood boards jointed so closely that dirt cannot accumulate between the boards, and so that the floors can be washed and dried again without allowing water to soak through into the rooms beneath.

Ceilings.—Ceilings under floors are not healthy although they are nearly always wanted on account of the better appearance people think they give to houses. Rats and mice nearly always make runs and nests in the space above the ceilings as they are safe there from their enemies, the cats.

Walls.—Besides being of sufficient strength to suport the weight of the floors and roof of the house and of the people who inhabit and furnish the house, walls must be so built as to keep out the rain and to remain dry themselves. Just as the red Canton tiles used in Hongkong for floors will absorb water and remain damp so will the cheap kinds of bricks. Therefore, unless a wall is built of good hard bricks or good stone which will not remain damp for long after rain, it is best to cover the outside of the walls with a coat of good cement plaster which will not absorb damp. It is even better still to put a coat of good paint over the plaster for the same purpose.

Walls should never be built with hollow spaces in their centres, as rats and mice will make nests and runs inside them and soon find their way into the house through the walls. It is a frequent thing in Hongkong to find that the tenants of a house have made small holes in the walls of their rooms for the purpose of fixing in the ends of poles used for making cubicles or sleeping rooms or of hanging clothes or curtains on. As in many of the old houses in Hongkong the walls are hollow and harbour rats, these animals make use of such holes for entering the rooms. It is very important therefore never to make such holes in walls and if any are found they should at once be filled up with good cement. The same applies to the inside walls or partitions in houses as to outside walls or walls separating one house from another.

Roofs.—These structures are essentially intended to keep out rain. They should therefore be made of good material which will not absorb water. In some countries slates are used on roofs and in others wood. Wood is dangerous because it is liable to take fire. In Hongkong tiles are used. These must be hard and not absorbent of water. The roofs should have a good slope so that rain may quickly run off and should completely protect the top of the walls of the house so that rain may not fall on them and make the walls damp.

Gutters to collect the rain water are often attached to the edges or eaves of roofs. These gutters sometimes get choked and little collections of water form in them. Mosquitoes may breed in these small pools and so endanger the health of the people living near. It is therefore necessary to occasionally inspect these gutters and clean them of any rubbish which may choke them.

Warming and Lighting.—In cold countries it is necessary to warm houses and in all countries it is the custom to use artificial light in houses.

In Chapter I, under Ventilation, it has been mentioned that fires and lights use up the air in a room and that therefore allowance for them must be made in calculating the amount of fresh air necessary for an inhabited room. All fire places whether used for cooking or warming rooms ought to have flues or chimneys to carry off the smoke and gases produced by the burning of the fuel. Lights such as candles, oil lamps and gas lamps do not generally cause smoke but they give off gases which, if they could not escape from the rooms, would soon render the air in them impure. These gases given off from the lights are hot at first and like smoke will rise to the top of the room. If then there are proper ventilating shafts in the roofs of rooms to carry these hot gases out through chimneys, the rooms will be better ventilated than where no such shafts are provided.

In China it is the custom to warm houses by burning charcoal in earthenware pots placed in the centre of a room and not provided with a flue to carry off the gases produced by the burning charcoal. This may sometimes be a dangerous practice for if the charcoal is not burning very brightly it is liable to give off a very poisonous gas, especially if a cast iron pot be used instead of an earthenware one. On this account such fires should be lit outside in the open air and only brought into the room when they are burning brightly. The pot containing the fire should have a plentiful supply of holes in its sides to allow air to get into the fire and keep it burning brightly.

Kitchens.—When it is remembered that food has to be cooked in the kitchens of houses and that food mixed with dirt may cause serious disease, it is seen how very important it is that kitchens should be so built as to be kept very clean, light and well ventilated. Unfortunately in Hongkong the kitchens of the houses are generally very small and are often dark and dirty.

The walls of a kitchen and the floor should be made so that they will not become sodden with water. For this reason the law in Hongkong now requires the walls and floors of kitchens to be covered with cement or other material which will not absorb moisture. The red Canton tiles often used are very bad for the floors of kitchens. The floors should be so made that any water falling on them may easily run off into the waste pipe provided outside the house. A leaky kitchen floor is a danger to the people using the kitchen underneath as dirty water may leak through into their food. No waste pipe should be allowed to become foul or choked and no dirty utensils should be kept in a kitchen ; no pots for nightsoil or urine should be kept in kitchens. In fact these important rooms should be kept as clean and dry as possible and should not be used for any other purpose than the preparation of food.

Latrines and Urinals.—The inmates of every house require the use of these conveniences daily. Every house ought therefore to be provided with them. On no account ought such conveniences to be provided inside the house; they should be outside in the garden or yard belonging to the house and as far away from the windows of the house as possible. These structures should be built of materials which will not absorb water and so that they may be easily kept clean and the nightsoil and urine should be removed every day.

Latrines should be well ventilated by openings in the walls and should frequently be limewashed inside.

For a urinal a covered earthenware jar or pot is the best and for a nightsoil pan a metal or earthenware vessel. The contents of a nightsoil pan should never be mixed with water, but rather they should be kept as dry as possible. It is therefore a good plan to put saw-dust or dry earth or opium packing into such pans to keep the contents as dry as possible.

Bath-rooms.—Every house ought to be provided with a bath-room. The walls and floors of bath-rooms ought to be made so as not to leak or absorb water just in the same way as in kitchens. They should be well ventilated and kept very clean and dry when not in use. The floors should, like kitchen floors be made so that any water spilt on them can run off into a water pipe or drain.

Cubicles or Sleeping-rooms.—In Hongkong owing to the shape of the rooms of Chinese houses it has been the practice to divide the rooms or floors of houses into a large number of smaller rooms or cubicles so that different families or different members of the same family may have separate private rooms.

As the window of a Chinese floor in Hongkong is generally at one end of the floor this system of making cubicles results in having a very large number of rooms which are badly lit and ventilated and therefore unhealthy. Unless a house has side windows as well as front windows such cubicles cannot be properly lit or ventilated. A dark room is nearly always a dirty room and from what has been said before it will be understood that to sleep in a small dirty room and breathe its foul air all through the night, because there is no window to provide fresh air, must in a little time be the cause of ill health.

From the foregoing remarks it will occur to everyone that it is his duty to do all in his power to keep his house as clean, light and well ventilated as possible, to keep out of his house all vermin and to be very careful of the cleanliness of his food.

ADVANCED COURSE.

Building Materials.—The materials of which houses are built vary much in the rate at which they will conduct heat, absorb moisture and allow the passage of air through them. Of these three properties the most important from a practical point of view is that of absorbing moisture and so rendering a house damp.

There are many expedients for counteracting this moisture absorbing quality of certain much used materials, *e.g.*, bricks. These consist amongst others of rendering walls with cement, lining them with glazed tiles, painting them, etc. One of the most important points is the drainage of the site on which a house is built if it should be found to be damp or waterlogged.

Damp courses ought always to be provided to the walls of houses. These are courses of material impervious to moisture laid in the walls of houses a few inches above the highest point at which the walls abut on the soil. They prevent the moisture of the soil from ascending the walls. For the construction of walls of houses and their coverings or linings see Willoughby's " Hygiene for Students ", Chapter X, pages 254-259.

Warming of Houses.—Domestic buildings in England are usually heated by open fires, *i.e.*, the room in which the fire is burning is heated chiefly by radiant heat. This is a very wasteful method of heating but is the healthiest method.

Big halls and public buildings are often heated by means of hot water or steam pipes laid along the sides of the room. This method warms the air of the room and is apt to cause a feeling of depression in the occupier of the room. Sometimes warming is combined with ventilation by passing fresh warmed air into the rooms and providing a shaft for the escape of the foul air which has been breathed. This system is seldom if ever successful in practice.

Instead of the open fireplaces there may be used stoves around which is passed fresh air from the outside by means of a pipe. The stove heats the air which is then allowed to escape into the room, supplying fresh warm air.

See Willoughby's " Hygiene for Students ", Chapter IX, pages 212 to 233, on the Laws of Heat and the Warming of Houses. See also Dr. Vivian Poore's book " The Dwelling-house ", Chapter I, which deals with certain defects in design of houses.

CHAPTER VI.

DISPOSAL OF REFUSE, SEWAGE AND STORM WATER.

ELEMENTARY COURSE.

Refuse and Sewage.—All households have a certain amount of waste matter which it is necessary to remove from the house as quickly as possible. This waste matter consists of the excreta of men and domestic animals, remains of animal and vegetable food, paper, old clothing and the general sweepings of the house.

Disposal of Refuse and Sewage in the Country.—In the country where every house has a garden or where fields are close at hand the disposal of this waste is easy. In the first place all such things as stones, bricks, broken glass or pots, pieces of tin, etc., should not be mixed with the rest of the rubbish consisting of things which soon get rotten. The broken pots, stones, etc., can be used for making paths or filling up and levelling hollows in the ground. This portion of the rubbish is not harmful. All that waste matter, however, which is capable of rotting should every day be removed and buried in the ground. It should not be buried deeply but just a few inches below the surface.

Plants should be grown on the ground in which the rubbish is buried. The rubbish treated in this way soon disappears and becomes converted into mould or garden earth which is very rich in nourishment for plants. A fresh place for the burial of the rubbish should be selected each day so that the old rubbish is not disturbed until it is turned into mould.

Nightsoil should be disposed of in the same way by burying it in the upper layer of the soil. This is a far better way than that of digging a cess pit or sump and allowing the nightsoil mixed with urine and water to decompose in it and then watering the ground with the resulting dark thick fluid from the cess pit. Above all it must be remembered to plant the ground in which these things have been buried. A garden which is manured in this way is a source of health and profit.

It is sometimes said that a garden manured in this way will cause poisoning of any wells that may be near it, but if the wells be constructed in the manner I have described in Chapter II, this will not happen. Cess pools or sumps are much more likely to cause poisoning of wells and springs than is the simple process of burying filth a few inches under the soil, because cess pools are deep and the deep layers of the soil cannot purify filth or convert it into mould as the upper layer can, and therefore if a cess pool leaks the filth in it may find its way unpurified into a well, stream, or spring from which water is drawn for drinking. Cess pools where they exist can however be made much safer if they are lined at the sides and bottom with good cement so that they cannot leak.

The practice so common in Chinese gardens of watering vegetables with liquid manure and diluted urine is not a healthy one as the vegetables if eaten without being thoroughly washed and cooked may cause disease.

In order that in country places where each house has a garden these methods of disposal of refuse may be properly carried out, it is necessary to have separate receptacles for house refuse and for excreta or nightsoil, and the nightsoil should be kept as free as possible from mixture with urine.

The best method of dealing with urine is to make a urinal out of a barrel or earthenware jar filled with garden earth which has first been dried in the sun. The barrel or jar must have a hole at its lowest point for drainage and have several holes in its sides about half way up so as to let air get into the earth. Such a barrel or jar should be placed in the garden under a roof so as to keep out rain and it should be a little way removed from the house. The earth will so alter the urine as it soaks through, that the liquid which drains out of the jar may be thrown on the soil of the garden without harm and the earth in the barrel will gradually become converted into a rich manure which can once in three to six months be taken out and spread over the garden, or a better plan would be to dig it into the soil whereby it would be enriched. Fresh pure urine if used to water plants acts as a poison to them and so it is the custom of Chinese gardeners to let urine get old and to dilute it with water before using it as a manure.

The barrel or jar method of making a urinal with the deposit of the contents on the garden now and then as above described is the best method in country districts.

Besides household refuse, nightsoil and urine, there is always a certain amount of dirty water known as slop water. It is best disposed of by being allowed to flow into the garden through a gutter and gradually being disposed of in the soil of the garden.

Disposal of Refuse and Sewage in Towns.—In towns and cities where houses are built without gardens and with only a small yard or narrow lane behind them, it is impossible for each householder to dispose of the waste matters from his house in the same way as can be done in the country. In the cities the inhabitants are engaged in other occupations than gardening and agriculture and so the governing body of the city has to make arrangements for the removal of the waste matters from the houses and for their disposal. In cities therefore the house refuse has to be carried away by men employed for that purpose.

For the house refuse apart from excretal matters every householder should provide himself with a covered box or tin into which he should put all his house refuse. This box should be kept as dry as possible and should be kept outside the house in the yard or court when there is one. The box should be emptied every day into the dust carts or baskets of the scavengers who should come into every street day after day for this purpose. After emptying, the boxes should always be cleaned and dried so that they may not cause bad smells. The house refuse so collected has to be disposed of somehow. The refuse from modern big cities always contains a lot of scraps of old iron, empty tins, broken bottles, pieces of brick and stones, and these things render the rubbish useless for manure for gardens. It is therefore usually the custom to dump the rubbish somewhere, where it will not cause a nuisance or to take it out to sea. If this latter course be adopted care must be taken that the rubbish is not washed back to the shore by the tide. In many places now all the rubbish from houses is destroyed by being burnt in a specially constructed furnace. This is a very good plan where other methods are not available or desirable.

House rubbish contains a lot of things which are very useful and so it pays to sort over rubbish and pick out glass, iron, paper, etc., at a rubbish depôt where large quantities of rubbish are dealt with. Enough useful matter can be picked out to make a profit by selling it. But the sorting over of rubbish is such a very unhealthy occupation that such a method ought never to be encouraged at a rubbish depôt. The proper place to sort rubbish is in the house of each individual householder. In other words each householder should find some other way of disposing of such things as bottles, pieces of iron and paper than by mixing them with the filth swept up from his house. But as long as people are careless and throw everything they do not want into the dust box, the only healthy way to dispose of such rubbish after collection is to burn it or dump it far out at sea. If it be piled in a heap at a distance from the town and allowed to accumulate it will become a nuisance some day when the town grows bigger and houses are built near such a rubbish heap.

Just as in cities where there are no gardens, the useful part of the rubbish for manure cannot be used and has to be carted away, so in cities such things as nightsoil and urine cannot be used as manure and have also to be taken away. The best way where possible is to have excretal matters removed every day and carried out of the town into the country for use as manure as is done in Hongkong. In order to do this without causing a nuisance it is necessary that all the receptacles for the carrying of the stuff shall be provided with covers and made of material which can easily be cleaned, and they should not leak. The same applies to all such things as carts and boats used for carrying these things, they must be thoroughly cleaned after use every day. The removal of such things must take place in the early hours of the morning before sunrise.

In many cities especially in England instead of having excreta carried off into the country to be used as manure, all such matter is carried away from the houses by the underground drains and sewers and gets into the sea or a river near at hand. Each house then, instead of having a dry privy, has what is called a water-closet which is practically a basin connected with an underground drain by a pipe. The excretal matters are washed down the pipe by allowing a stream of water to flow into the basin so that its contents are at once washed away. This is a very convenient method of getting rid of excreta for the householder, but it has the effect of often making the rivers and harbours into which the excreta are washed very foul. If this method be adopted it is very necessary that such water-closets should be properly constructed and above all that the underground drain and sewers should never leak. If these drains and sewers do leak then the ground gets very foul, and if there should happen to be a leaky water pipe near a leaky drain the water may be poisoned by the filth leaking from the drain. On account of the frequent leakage of drains and sewers it has become necessary to close wells in towns which have sewers because they are likely to become poisoned by leaky sewers near at hand.

Slop Water.—Even if excretal matters are removed by being daily carried away to the country as is done in Hongkong yet in cities there is still the difficulty of disposing of the slop water from houses. There being no gardens around the houses it is impossible to let such slops soak into the ground and so be purified. Only ground which grows plants is able to purify slop water and so if in cities we were to allow all slop water to soak into the ground, the soil under the houses and in the streets would soon become very foul and the slop water might find its way into wells and leaky water pipes and make the water in them dangerous to drink.

It is usual therefore in cities to provide drains and sewers which are really underground pipes to carry away the slop water from the houses and discharge it into the sea or a river. In Hongkong the slop water from each house and each kitchen flows out of the house through the wall and enters a pipe running down the outside of the wall of the house. This pipe discharges over a hole in the ground covered with a grating. This hole is really the entrance to a pipe which carries away the slop water under the ground, sometimes passing under the houses, sometimes under back yards or back lanes only until it joins a larger pipe under the main street. This larger pipe ultimately reaches the sea where the slop water is discharged.

The first part of the pipe immediately under the hole in the ground into which the slop water flows is always made with a double bend so that some water always remains at the bend of the pipe. The water is intended to keep bad smelling air from the pipe below the ground from coming up into the lanes and yards around the houses, therefore this part of the pipe is called a trap. These traps can be seen all over the city of Victoria in the yards and back lanes of the houses. The water in these traps often becomes very foul especially in the dry season or if a trap be not used frequently. They then smell strongly causing offence. Such trap therefore should never be excessive in number and they should never be placed inside a house but always in the open air and as far from the windows of houses as possible. Moreover mosquitoes often breed in these traps if the water remains stagnant for a few days. In order to prevent these traps from becoming foul and from breeding mosquitoes it is advisable when water is scarce and the weather is dry to put into the trap a little Jeys' fluid (臭水 or chloride of lime (粉白曬) twice a week.

The pipes and traps which are intended to take away the slop water from houses should never have solid rubbish or filth put into them; otherwise they may become choked and cause a nuisance.

Sometimes in Hongkong the pipe which carries away the slop water from the kitchen of a house does not discharge its water into a trap but into a cement channel which may run at the back of several houses which have similar slop water pipes discharging into it. In this way it is possible to have only one trap at the end of this cement channel for several houses so that there are less traps able to cause a nuisance than where every slop water pipe has a trap to itself. Every householder should therefore keep the slop water pipe and the trap and cement channels which belong to his house in a clean condition and should not allow refuse to collect in them to the annoyance of his neighbours. The proper place to put refuse in is the dust or rubbish box, not the slop water pipes or channels.

Storm Water.—By storm water is meant the rain water which during heavy showers of rain frequently causes a temporary flooding of the surface of the ground. In the country such water finds its way by natural water courses into streams or rivers and thence to the sea. But in cities it is necessary to provide artificial channels for this water to run off from the street so that the houses adjoining the street may not be flooded.

For this reason streets in cities are made with channels or gutters at their sides into which the rain water flows. In these side channels there are placed at frequent intervals gratings through which the water flows into an underground passage and ultimately finds its way into the sea or the nearest river.

In Hongkong the storm water finds its way by these underground passages into the harbour.

A large amount of rain often falls in a few hours in tropical places like Hongkong and so it is necessary to make these underground passages big enough to carry off a lot of water. Much of the rain in cities falls on the roofs of houses and in order to prevent this water from discharging in heavy streams straight from the roofs on to the streets it is necessary to fix gutters along the edges of the roofs and to bring the water down from them into the streets by pipes. In tropical countries where very heavy rain falls it is necessary to keep rain as much as possible out of the underground pipes which carry away the slop water from the houses because so much rain falling in a very short time would burst the slop water pipes if it was allowed to flow into them. Therefore in Hongkong we have two systems of underground drains, one for carrying off the slop water from houses, and another one for carrying off the excessively heavy fall of rain water during the rainy season.

When a city is built like Victoria is on the side of a steep hill one has to provide for the passage of the water which rushes down the hillside through the city. The natural water courses in which the water flows down the hillside are called *nullahs*. Where those *nullahs* enter the city they are sometimes covered over and flow under the ground. It is better that they should not be covered in but simply bridged over where it is necessary for a road or a path to cross them. But whether they are covered in or only bridged over it is very important that they shall be trained or have their sides and bottom built of smooth material and so arranged that no pools of water can stand in them. If pools of water collect in these nullahs and remain still for a few days mosquitoes will breed in them and possibly spread malarial fever.

ADVANCED COURSE.

Removal of Sewage from Houses.—Whether the sewage from houses is ultimately carried away in the same large sewers with the storm water, as in the combined system generally followed in England, or is carried off in sewers of its own which do not admit the storm water as is the case in Hongkong (Separate System), it is absolutely necessary that the mechanical arrangements of traps, waste pipes and house drains within the curtilages of houses shall be of proper design and workmanship.

If water-closets are used it is important that they shall be of proper pattern, many of the old forms of water-closets are insanitary abominations.

For the methods now in vogue in fitting houses with such sanitary appliances as water-closets, waste and ventilation pipes, house drains, etc., see Willoughby's "Hygiene for Students", Chapter X, pages 235 to 253.

For more scientific and healthful methods of disposal of all household refuse which can be adopted in all country districts, see Poore's "The Dwelling-house", Chapters III and IV.

In cities, which owing to lack of ground for dealing with the slop water and excreta from houses, there has gradually grown up the water-carriage system whereby these materials are conveyed by sewers to some point where they can be discharged into the sea or river or be dealt with by some method whereby the sewage is to a greater or less extent purified.

In a city there must be sewers for the conveyance of the slop water from houses but it is not necessary that excretal matters should also be passed into the sewers. Dry privies and earth closets on the so-called pail system can be adopted. This involves a properly organised system of daily removal and a market for the disposal of the excreta. In Hongkong this method is adopted, the excreta having a high value in the silk districts of Kwang Tung for manurial purposes. If, however, for any reason the water-carriage system is extended to excretal matters as well as to slop water and water-closets are introduced, the resulting sewage needs more careful treatment in its ultimate disposal.

When water-closets were first introduced and water-carriage through sewers became general the sewage was generally allowed to flow into the nearest river or harbour; great pollution of water-courses was the result. To prevent this, various methods of treating sewage before allowing it to flow into a water-course have been invented.

These may be grouped under the following heads :—

1.—Chemical treatment whereby the sewage is purified by means of certain chemicals added to it in large tanks so as to precipitate the harmful bodies present before allowing the water to run off.

2.—Sewage farms where the sewage is passed through land as through a filter, manuring the land in its passage and affording nourishment for vegetables grown on the land.

3.—Simple filtration through land without farming.

4.—Bacterial process. In this process the sewage is led into a tank where it undergoes fermenting change caused by the presence of micro-organisms in the sewage resulting in the ultimate solution of almost all the solid matter contained in the crude sewage. The resulting liquid is then passed through one or more filters generally made of coke which by means of the micro-organisms they contain purify the sewage so that the liquid which ultimately has to be disposed of may be turned into a river without harm.

For the mannagement of the water-carriage system and the necessary purification of the sewage see Willoughby's "Hygiene for Students", Chapter XIV, pages 334 to 360.

CHAPTER VII.

SOME INFECTIOUS DISEASES.

ELEMENTARY COURSE.

There are many diseases which are infectious or communicable from one person to another, so that if one person suffering from one of such diseases comes into a village or city he may give the disease to many others.

In the East there are two diseases which often cause the death of many hundreds or thousands of persons in a short time and which are so dangerous to life that very few persons attention and cause panic amongst the inhabitants on account Plague. Although these two diseases attract a great deal of attention and causes panic amongst the inhabitants on account of the frequent suddenness with which they spread in a short time throughout a city or district, yet they are not the only dangerous infectious diseases which cause the dealths of large numbers of people.

We have also such diseases as Malarial Fever, Consumption, Typhoid Fever and Small-pox. These diseases do not attract so much attention from the people as Cholera and Plague, partly because they are always present to a greater or less extent amongst the inhabitants of Eastern countries and partly because they do not generally, like Cholera and Plague, cause an unusually large number of deaths in a very short time.

In order to know how best to protect people against these infectious diseases it is necessary to know something about the causes of the diseases and how they spread from one person to together.

As these diseases differ in important points as to the methods by which they are usually conveyed from one person to another it is best to consider them separately, except in the case of Cholera and Typhoid Fever which may be considered together.

Plague.—This disease is caused by a very minute living plant which is so small that it requires to be magnified several hundred times before it can be easily distinguished. This living plant or parasite gets into the body and lives there and multiplies so that very soon the body swarms with millions of these parasites. In living and multiplying they poison the person attacked so that he gets sick and death generally occurs.

When a person is suffering from plague the discharges from his body contain the parasite. The clothing, bed, beding and all articles used by the patient are therefore liable to be contaminated. This forms a danger to other persons living with the patient as these discharges and contaminated articles may, if the persons handling or touching them have scratches, cuts or sores on their bodies, infect such persons with the disease.

Sometimes it happens that plague attacks chiefly the lungs of a patient and when this occurs the air in the neighbourhood of the patient gets contaminated with the parasites which are discharged from the lungs by coughing. Other people who breathe this air are likely to be infected with this form of plague which is called Pneumonic Plague.

As this form of plague is very infectious, it is fortunate that it is somewhat rare. In different epidemics in Hongkong this form of plague has occurred generally in less than 4 per cent. of the cases.

The above methods of catching plague are however not the usual ones. The parasite of plague which is known as the plague bacillus does not live long after it has been discharged from the body. Hence unless the discharges from a patient are fresh they are not likely to infect another person.

The usual method of spreading plague is through the bites of fleas which have previously been living on a rat which has died of plague.

Plague is first of all a disease of rats and it has been discovered that when plague is present amongst the population of a district there is always plague amongst the rats as well.

Plague begins amongst the rats and then spreads to human beings, and it has been discovered that as the number of infected rats increases so the number of human cases increases. Again as towards the end of a plague season the number of infected rats gets less and less, so the human cases get less until human cases cease for that season. The increases and decreases in the number of human cases follow the corresponding increases and decreases in the infected rats in about 10-14 days.

Plague, however, does not entirely cease amongst rats at the end of a plague season, but continues all the year round to a slight extent and this accounts for the few human cases which also occur now and then between the end of one plague season and the beginning of the next.

Fleas are found on all rats and they are especially abundant on sick rats. Fleas live only on blood which they suck from the body of their host, so if a rat be infected with plague the fleas will suck into their stomachs some plague bacilli with the rat blood. These bacilli live and multiply in the fleas' stomachs.

When a plague-infected rat has died its fleas can no longer get blood from it and so they leave the body. If they can find other rats they go to them, but if they find no other rat to go to, they soon begin to get hungry.

Now there are several kinds of fleas each of which has its own host, for example, there is the human flea, the dog flea and the rat flea.

It is the last mentioned flea which spreads plague.

The rat flea does not like to live on human beings, but if it can find no rats it will bite human beings when it gets hungry. It usually takes about three days fasting to make a rat flea hungry enough to bite a human being. Fleas have the peculiar habit of discharging a previously taken meal of blood to make room for a fresh meal just at the time when they are about to bite. When they do this therefore on the skin of a human being they put on the skin a large number of plague bacilli if they have previously been feeding on an infected rat. Then when they prick the skin to suck blood these bacilli get into the patient's body. The process is very like that of vaccination when we scratch the skin of a person and put lymph on the scratch.

Between the time that the person has been bitten by a plague carrying flea and the time the person begins to feel ill, three days usually elapse. This is called the incubation period. The illness usually lasts about 6 days and then the patient dies.

We have therefore three periods of three, three and six days between the death of the rat and the death of the human being infected from the rat.

These three periods make a total of twelve days which corresponds to the time, ten to fourteen days, found by observation to elapse between the increase of rat plague and human plague in an infected district.

Fleas begin to be more prevalent in the early months of the year in Hongkong, and so at this time plague is more frequently spread from rat to rat by them. As more and more rats are then infected so the chances of human infection increase. When the weather gets very hot the number of fleas decreases and they are not able to carry plague bacilli in their stomachs so long as they can when the weather is not so hot.

After a plague season is over the rats breed rapidly so that at the beginning of the next season there are a large number of young rats in the district. Plague spreads easily amongst the young rats. These two facts are the cause of plague occurring in distinct season.

ANTI-PLAGUE MEASURES.

It is clear that to combat plague we must do all we can to destroy rats and to keep them out of houses. In any district where plague occurs rats ought to be kept down by continuous trapping and poisoning.

To keep rats out of houses people should always be on the watch to defect rat runs and holes. These should be filled up with broken glass and cement. Floors on the ground surface should be made of hard material which rats cannot burrow through. Walls of houses should never be hollow as rats can find shelter in such.

Ceilings should be abolished as rats find good shelter above them and should a rat die of plague above a ceiling its fleas can readily drop through the crevices of the ceiling into the room below.

Rats often make nests in rooms behind lumber which is left for a long time undisturbed. Such lumber should therefore be frequently turned out to disturb rats and to allow for cleansing and inspection for rat holes.

Waste food and rubbish which will attract rats should never be left to lie carelessly about houses.

If a rat has recently died of plague it may still have fleas on it and there is therefore danger in handling a dead rat. Whenever a dead rat is seen it should have some liquid which will kill fleas poured over it and then be picked up with some instrument and taken to the nearest of the rat bins which are placed in the streets in Hongkong fixed to lamp posts, etc., or it may be burnt.

Fleas can be easily killed by being immersed in some oily fluid. One of the best fluids for this purpose is an emulsion of kerosene oil and soap which is used largely by the Government of Hongkong for washing houses in order to kill fleas. This fluid is very cheap and can be obtained from local chemists. It should be used mixed with water in a strength of 2 per cent. The Government of Hongkong adopts as a plague preventive measure a periodical turning out and cleaning of houses. This disturbs rats and prevents their making their nests in the houses in peace. At the same time all rats holes found are filled up and defective floors repaired. Also the houses and furniture are washed with or dipped in a mixture of water and the oil and soap emulsion mentioned above. This is done to kill fleas. This kind of work cannot be done by the Government often enough to ensure safety from plague and so the people ought to be themselves always in the watch to prevent rats infecting their houses and to keep the houses thoroughly clean.

When people notice dead rats in their houses they should always inform the Sanitary Authority in order that steps may be taken to prevent human plague occurring in the locality. Also when a human case of plague occurs the fact should be reported as soon as possible to the Sanitary Authority.

The reasons for these are first that the patient may be removed, if necessary, to some place where proper care may be given him and also that steps may be taken to prevent other cases occurring in the neighbourhood by measures directed against rat and flea infestation of the houses. The earlier a patient is taken to hospital for treatment the greater are his chances of recovery.

All clothing and bedding used by a plague patient ought to be given up to the Sanitary Authority for disinfection. This will destroy any fleas that might still be in these articles and also any plague bacilli that may be still living in the discharges from the patient soiling the clothing.

In the absence of any arrangement for having this disinfection done by some Sanitary Officials, such articles can be dipped in boiling water or soaked in a five per cent. solution of Jeyes' fluid or similar preparation. All fleas will be speedily killed if the articles harbouring them are soaked in a two per cent. mixture of the kerosene and soap emulsion with water.

Malarial Fever.—This disease is caused by a minute animal which lives in the blood of an infected person and by poisoning him causes the symptoms of the disease. This minute animal parasite gets into the blood of a person from the proboscis of a kind of mosquito called *Anopheles.*

When a mosquito which is infected with these parasites bites a person it injects into the blood at the same time a little fluid containing the malarial parasites. These parasites then multiply in the blood of the person and cause him to show the symptoms of malarial fever. But before a mosquito can infect a person it is necessary for the mosquito itself to be infected with these parasites. The mosquito gets infected by biting and sucking the blood from an infected person. Mosquitoes therefore are the means of spreading malarial fever from one person to another. If there were no mosquitoes in a district malarial fever could not spread from one person to another, and if no person suffering from malarial fever were to come into a district even where there are mosquitoes no malarial fever could arise in the district as the mosquitoes could not get infected.

It will be seen from this that there are two ways in which malarial fever can be prevented, namely, (1) by destroying mosquitoes so that there will remain none to spread the disease from one person to another ; (2) by curing malarial fever in persons so that these mosquitoes cannot get infected by sucking the blood of persons who have the disease.

How to destroy Mosquitoes.—These insects always lay their eggs in pools of water, therefore if there are no pools of water about a district there can be no mosquitoes. All pools of water, whether large or small, are a danger and should be done away with. Especially dangerous are the little pools of water which collect in old tins and pots in the neighbourhood of houses and gardens. If there be pools of water which cannot be done away with a little Jeyes' fluid or kerosene oil should be put into them twice a week, this will prevent mosquitoes breeding in them.

Mosquitoes can be destroyed in a house by closing all doors and windows and burning a little sulphur in each room. The vapour of the burning sulphur kills the mosquitoes.

Mosquitoes rest under the leaves of trees and bushes where they can find shelter from strong breezes, it is therefore a good thing to avoid thick growth of trees and bushes in gardens around houses.

To cure Malarial Fever.—There is a drug which has a wonderful effect in curing malarial fever, namely, quinine.

It is not, however, safe for people to take this medicine in large quantities except under the advice of a medical man, therefore when a person is attacked with fever it is necessary to call in the help of a medical man. But it is quite reasonable for people who live in a district where malarial fever occurs to take a small quantity of quinine twice a week. If an adult takes five grains of quinine twice a week he may avoid getting malarial fever even although he be frequently bitten by mosquitoes.

In a very large community it is not possible to destroy all mosquitoes nor to recognise and cure every case of malarial fever which may occur. Consequently although a very great deal may be done to reduce the number of mosquitoes and to persuade the patients to go to a hospital where they can be properly treated, there is always a risk of acquiring malarial fever.

But this risk may be further reduced by using precautions against being bitten by mosquitoes. Mosquitoes bite mostly at night and people would always protect themselves from being bitten by using mosquito nets around their beds. It must be remembered that the less the number of persons who suffer from malaria the less chance is there of the mosquitoes in a district being infected, and again the more trouble we take to destroy mosquitoes and do away with their breeding pools the less number of those insects there will be to convey the disease from one person to another.

Districts which have been very unhealthy from the prevalence of malarial fever have lately become healthy owing to proper measures having been taken to destroy mosquitoes.

Cholera and Typhoid Fever.—These two diseases can be considered together. They are both caused by the eating of food or drinking of water which has been contaminated by the excreta of patients suffering from these diseases. They are sometimes called *water-borne diseases* because if by any chance the water supply of a community should be contaminated by the excreta of patients suffering from these diseases many scores, hundreds or even thousands of people who drink the water may get the diseases. In both these diseases there is profuse diarrhœa and therefore unless great care is taken it is easy for such water supplies as wells, tanks or water cisterns in the yards of houses to get contaminated by the contents of urinals and privies in yards. It is especially dangerous to have such conveniences in kitchens as the food supply may be contaminated thereby.

As excretal matters are used largely by vegetable growers as manure, the vegetables may be contaminated by excreta, and if eaten raw may cause these diseases.

The proper cooking of all food and the boiling of water before drinking, is a very great precaution against these diseases. The use of tea as a beverage amongst the Chinese instead of cold water must have a very great effect in protecting them against outbreaks of these diseases as the water supply of Chinese cities and villages is not generally good, there being little if any care taken to protect their wells from the access of dirt and sewage.

Small-pox.—This disease is common in the East. It is a very infectious disease and very dangerous to life.

The exact cause of the disease is not yet known, but it is known that a patient is capable of infecting another person by means of the discharges from the eruption of the skin. The clothing, bedding and all personal effects of a small-pox patient are highly infective. The atmosphere near the patient contains material derived from the skin of the patient and is also infective.

A patient suffering from this disease should, therefore, be immediately removed to a hospital where he can be treated without danger to other people, and the paitent's house and all his effects should be immediately cleansed and disinfected. A small-pox patient continues to be infective until his skin is perfectly healed and all scaling is over.

There is one method whereby people can escape being attacked by small-pox. This is by vaccination. Every child should be vaccinated before it is three months old and vaccination should be repeated about once every six or seven years. If a person has been properly vaccinated and re-vaccinated it is almost certain that he can never get small-pox.

Consumption.—This is a disease from which many hundreds of persons die in Hongkong every year. It is caused by a minute vegetable parasite which grows in the lungs so that the patient ultimately dies.

The chief method of the spread of this disease from one person to another is through the dirty habit of spitting at all times and in all places. The sputum of a person suffering from consumption contains the parasites which cause this disease. When such a person spits on the floor of a house the sputum soon dries and is blown about as dust. The parasites are not killed by such drying and hence this dust is very liable to infect other persons breathing the air of the same room.

Overcrowding of rooms and want of the proper amount of fresh air increases the danger of the spread of consumption. One person suffering from consumption in a house is thus a danger to all the other inmates.

The precaution to be taken to guard against infection with this disease are the avoidance of overcrowding of houses and the proper ventilation of rooms, especially sleeping rooms, the cleansing of houses by frequent washing of them, the avoidance of the bad habit of spitting anywhere except in a proper spittoon. Spittoons should always contain some water or disinfectant solution such as Jeyes' fluid so that the sputum may not dry and be blown about as dust. All eating utensils, towels and handkerchiefs, etc., used by a consumptive patient should be kept for his use alone and never used by other people. No other person should share the same bed or cubicle with a consumptive person as the air in the immediate neighbourhood of such patient is rendered infective by the patient's coughing.

ADVANCED COURSE.

Besides the few diseases mentioned above, there are many other diseases which, owing to their being, to a very great extent, preventible and controlable by the observance of well-known rules of health, and by sanitary administration, are often known as Preventible Diseases.

In Willoughby's " Hygiene for Students ", Chapters XV and XVI, will be found a fairly complete epitome of the nature and cause and control of such diseases.

The modern control of infectious disease is found on the following principles :—

1. *Notification* of cases of infectious diseases to the Health Authorities. This is essential as a first step, as without it none of the following active measures can be undertaken.
2. *Isolation* of the infected person in a properly appointed hospital where he can be treated without danger of infecting his neighbours.
3. *Disinfection.*—As the modern theory of infection is that all infectious disease is due to the infection of the person by some living parasite derived from a previous case of the same disease, and as experience has shewn that by certain means infective material which will certainly exist in the house from which a patient has just been removed can be destroyed, it is absolutely necessary on the removal of a patient suffering from an infectious disease to hospital to take proper steps for the destruction of all infective matter in the house and effects of the patient. There are many available methods of doing this which is technically called disinfection. For an account of what disinfection really is see Willoughby's " Hygiene for Students ", Chapter XVI, pp. 417-424.

4. *Quarantine and Observation.*—Suppose that a case of small-pox occurs in a member of a family and that immediate steps are taken to remove the patient and to disinfect the house, it does not follow that no other members of the family will develop the disease. The rest of the family having been exposed to the risk of infection might be infected and yet not show signs of illness until from 10 to 12 days after their exposure. This period of 10 to 12 days is called the *incubation period* of the disease and it is clear that if we wish to avoid all chance of the spread of small-pox from this family to others in the neighbourhood we must isolate this family for 12 days at least after the removal of the discovered case to hospital. But rather more than 12 days' isolation should be insisted on so as to leave a margin for safety—a margin of 3 days over the maximum incubation period should be allowed for.

Such an isolation during which the family are watched by a medical man for any signs of further cases of the disease is called a Quarantine. The length of quarantine necessary for each different disease will depend, therefore, on the length of the incubation period of each disease. The incubation periods for certain of the more important communicable diseases are as follows :—

Small-pox,	10 to 12 days.
Plague,	about 3 days.
Cholera,	a few hours to 2 days.
Typhoid Fever,	about 14 days.
Scarlet Fever,	2 to 4 days.
Diphtheria,	about 2 days.
Measles,	about 10 days.
Whooping Cough,	about 10 days.

CHAPTER VIII.

SANITARY LAW.

If the principles of Hygiene were understood by every one and each inhabitant of a country ordered his life in accordance with these principles there would be little or no need of passing laws on the subject.

The conditions under which people live in cities, however, prevent individuals from doing all that is necessary to protect themselves from the consequences of neglect of these principles. For example, men who are engaged in their business occupations are unable themselves to attend to the important work of keeping their city clean. It is necessary that a special staff of men be employed to do this work and regulations for the proper performance of such work are required. The same thing can be said of such work as the removal of sick persons to hospitals and their proper treatment therein, and the cleansing and disinfection of houses when cases of infectious disease occur.

Again there are always to be found in every community people who will not take the trouble to so conduct themselves as not to cause annoyance to and endanger the health of their fellow citizens. For example, some people, if permitted to do so, would allow their houses to become and remain extremely filthy. Employers of labour will sometimes pay no attention to the need of giving their employees healthy sorroundings to work in, but are oblivious of the health of their labourers so long as they themselves can make profit out of them.

Owners of houses will sometimes neglect to keep their property in fit condition for human beings to live in. Laws are, therefore, necessary to prevent these risks and although they may at times be considered somewhat irksome yet they are made with the object of assuring the people such conditions of life as will promote their well being and reduce sickness and, therefore, contribute to the contentment and prosperity of the community as a whole. In Hongkong the rules and regulations necessary for the health of the community are provided by the Public Health and Buildings Ordinance. This Ordinance is divided into seven parts and eleven schedules.

In this chapter we shall only deal with certain extracts from Parts I, II and III, and Schedule B.

Part I is preliminary and amongst other matters contains the definitions or explanations of the meanings of various terms used in the following parts. For example, the definitions of a room and a cubicle explain exactly what are understood by these words when used in any of the clauses of the Ordinance regulating these structures.

Instead of giving these definitions here we shall give them, if necessary, when considering the various clauses of the Ordinance in which these terms are used.

Part II deals with Public Health and Part III with buildings. Much of what is contained in Part III is very technical and refers to the erection of buildings and is for the guidance of house owners, architects and building contractors. There are however several matters in this part which it is necessary for the general public to understand. Schedule B contains the bye-laws which are made by the Sanitary Board and have when approved by the Governor-in-Council the same force as any provision in the Ordinance itself.

Part II.

The most important points to be noted in this part of the Ordinance are that it gives the Sanitary Board power to make bye-laws and that it contains clauses dealing with the following matters:—Nuisances, Common Lodging Houses, Basements, Overcrowding, Unwholesome Food, Removal of Infected Persons, and Cemeteries.

We will deal with these subjects one by one and will consider any bye-laws relating to them at the same time.

Nuisances.—A great deal of disease may result from uncleanliness, either directly or indirectly. The continual living amongst filthy surroundings, if it does not result in the production of one or other of the recognised infectious diseases, will yet seriously undermine the health of the people.

It is in cities and towns especially that such conditions are likely to have most effect on the health of the inhabitants, and experience has shown that these are certain well known evils likely to be found.

The law, therefore, describes these evils and makes strict rules for their abatement whenever they may be found. These conditions are known as Nuisances and twelve of them are described in section 26 of the Public Health and Buildings Ordinance. They are as follows :—

1. Any building or part of a building which is so dark, or so ill ventilated, or so damp, or in such a condition of dilapidation as to be dangerous or prejudicial to the health of the inmates.
2. Any building or part of a building which contains rat holes or rat runs or other similar holes, or which is infested with rats, or in which the ventilating openings are not protected by gratings in such manner as to effectually exclude rats from such building.
3. Any premises which are in such a dirty or in such an insanitary condition as to be dangerous or prejudicial to health.
4. Any street or road, or any part thereof, or any water-course, nullah, ditch, gutter, side-channel, drain, ash-pit, sewer, urinal or cess-pool so foul as to be noxious, or noisome, or unhealthy.
5. Any water-course, well, tank, pool, pond, canal, conduit, or cistern, the water of which, from any cause, is so tainted with impurities, or so unwholesome as to be injurious to the health of persons living near, or using such water or which is likely to promote or aggravate epidemic disease.
6. Any stables, cow-house, pig-sty, or other premises for the use of animals, or in which live fish or birds are kept, which is in such a condition as to be injurious to the health of man or such animals,

7. Any accumulation, or deposit of stagnant water, sullage water, manure, house-refuse, or other matter, wherever situated, which is unhealthy.

8. Any noxious matter, or waste-waters, flowing or discharged from any premises, wherever situated, into any public street, road, or into the gutter or side-channel of any street or road or into any nullah, or water-course, or the bed thereof.

9. Any manufacture, trade, or business of a noxious, noisome, or unhealthy nature.

10. Any cemetery, or place of burial, so situated, or so conducted, as to be unhealthy.

11. Any chimney (not being the chimney of a private dwelling house) or any furnace sending forth black-smoke in such quantity as to be a nuisance.

12. Any act, omission, or thing which is, or may be, dangerous to life, or injurious to health or property.

When any of these nuisances is discovered and reported to the Sanitary Board the Board after satisfying itself of the existence of the nuisance issues a notice to the author of the nuisance ordering him to abate it and if the nuisance is not then abated the Board has power to take proceedings before a Magistrate who may punish the offender by a fine.

Common Lodging Houses.—A Common Lodging House is defined as follows:—"Any house or part thereof or other permanent structure where male persons of the labouring, artizan or mechanical classes not being members of the same family to the number of ten persons or upwards are housed, but does not include a house or other permanent structure where shopmen or domestic servants are housed by their employers."

When several men share a house in common the duty of keeping the house clean is likely to be put off by each man on to his fellow lodgers and the house neglected. It is, therefore, necessary to have special laws for this class of houses.

Section 38 of the Public Health and Buildings Ordinance forbids such houses being opened without permission from the Registrar General and requires them to be registered as being kept by some one person who then becomes responsible for the proper carrying out of the sanitary laws in such house.

The principal laws regulating the sanitary condition of Common Lodging Houses are found in the Common Lodging House Bye-laws and are as follows :—

> " 4. Any house to be registered as a common lodging-house must be substantially built and in a good state of repair, and must be adequately lit and ventilated to the satisfaction of the Board, and all the rooms which are to be used as sleeping-rooms must be on all sides above the level of ground immediately surrounding the house. The house-drains must be in good order and constructed in accordance with the bye-laws regulating house drainage, and there must be adequate kitchen, ablution, privy, urinal and ash-bin accommodation; and unless when the supply of water is constant, there must be a proper cistern for the storage of water.
>
> 9. The keeper of a common lodging-house shall not permit his premises to be occupied, between the hours of 11 p.m. and 5 a.m., by a greater number of persons than that specified on the licence issued to him by the Secretary for Chinese Affairs.
>
> 12. The keeper of a common lodging-house shall cause the windows of each of the sleeping rooms to be kept open to their full width for at least four hours each day, unless prevented by inclement weather or by the illness of any person occupying any of the rooms.
>
> 13. The keeper of a common lodging-house shall cause the internal walls and ceilings of every part of his house to be thoroughly cleansed and lime-washed during the months of January and July of each year.

14. The keeper of a common lodging-house shall at all times keep his premises in a clean and wholesome condition, and the fittings of the sleeping-rooms shall be maintained by him in a thorough state of repair. He shall cause every room, passage and stair to be thoroughly swept at least once a day.

15. The keeper of a common lodging-house shall cause all filth and house-refuse or other offensive matter to be removed from his premises daily.

16. If any person in common lodging-house becomes ill from any infectious, contagious, or communicable disease, the keeper of such common lodging-house shall forthwith give notice thereof to the Sanitary Inspector in whose district the lodging-house is situated, or to the nearest Police Station or to the Secretary for Chinese Affairs, and the keeper of such common lodging-house shall cause the house to be vacated and shall allow the bedding, clothing, and other articles used by the infected person to be destroyed or disinfected and the house to be fumigated, disinfected and lime-washed, at the public expense."

Basements.—The definition of a basement is as follows :—
" 'Basement' means any cellar, vault, or underground room or any room any side of which abuts on or against the earth or soil."

Rooms which are wholly or partly below the level of the ground or whose walls abut on the earth are likely to be unhealthy on account of darkness, dampness, and want of ventilation. The law, therefore, imposes restrictions on the use of such rooms.

Under Section 45 of the Ordinance it is illegal to live in, occupy or use any basement even as a shop or workshop or factory or a place in which to prepare or store food unless with the permission of the Sanitary Board.

The Board will under certain conditions grant permits for the use of basements and these conditions are regulated by the basement bye-laws. These bye-laws are somewhat technical but they may for practical purposes be described as follows :—

I.—A basement before it may be used as a dwelling house must be lit and ventilated by a glazed window of an area equal at least to one-tenth of the floor area of the basement and opening into the external air. The height of the ground above the floor of the basement must on no side of the room be greater on the average than four feet where it actually touches the wall, and if above this level there is an area constructed so as to keep the ground away from the wall, this area must be eight feet wide and not obstructed by coverings except by permission of the Sanitary Board.

II.—A basement before it may be used as a shop, worshop or factory must either comply with the same regulations as for use as a dwelling, or it may be so used if it is not more than thirty feet deep when measured from its front wall to its back wall and is properly lighted and ventilated to the satisfaction of the Board.

Overcrowding.—Overcrowding of houses brings disease in its train because the occupants have not sufficient fresh air and it also helps the spread of infectious disease.

The law insists that each person occupying a house at night shall have a certain amount of space in the room he is occupying. When there are no cubicles in a room the space required for each person is regulated as follows : He must have at least thirty square feet of floor space and three hundred and thirty cubic feet of air space. But when a room contains one or more cubicles each person occupying the room must have at least fifty square feet of floor space and five hundred and fifty cubic feet of air space.

In the European Reservations each person must have one thousand cubic feet of air space except in the servants' quarters which may be occupied according to the same regulations which apply to houses not in European Reservations.

The sections dealing with overcrowding and its abatement are Sections 46 to 51 of the Public Health and Buildings Ordinance.

Unwholesome Food.—Food may be adulterated, that is, mixed with some substance other than that which it is supposed to contain, for example, tea may be adulterated by mixing with it the leaves of other plants than the tea plant. Sometimes the substances so mixed with food are very harmful to the consumer and in any case the purchaser of such food is defrauded.

Again food originally good may become unfit to eat because it has begun to decompose, or an animal which has been suffering from some disease may die or be slaughtered and its flesh sold for food. To eat such food is highly dangerous and the law therefore in Sections 82 and 83 of the Ordinance forbids any one to sell, expose for sale, or bring into the Colony or into any market any food for man in a tainted, adulterated, diseased or unwholesome state. Any food found in any premises, in such a state, may be seized and destroyed by order of the President of the Sanitary Board. Also the person on whose premises such food is found may be heavily fined unless he can prove that the food was not intended to be used as food for men.

Milk is a food which has often been known to spread disease when it has been contaminated with the germs (micro-organisms) which cause diseases.

If an inmate of a dairy or any person who milks cows or handles the milk vessels is infected with disease such as Cholera, Typhoid Fever, Scarlet Fever or Diphtheria or even if such person has merely been in contact with some one so suffering, this person may contaminate the milk and give it the power of infecting those who drink it.

The disease known as Tuberculosis, which when it attacks the lungs is called consumption, can also be spread by milk, and as cows often suffer from this disease their milk is capable of conveying it to those who drink it.

In order to check the spread of disease through infected milk the law by Section 84 of the Ordinance gives powers to the Medical Officer of Health and the Colonial Veterinary Surgeon to visit dairies and cowsheds which may be suspected of being the means of spreading disease and to examine the people residing or employed therein, and also to examine the animals there.

If the Medical Officer of Health is then satisfied that milk from such diary or cowshed is the means of spreading disease he will report to the Government and His Excellency the Governor may order that no more milk be supplied from that dairy or cowshed until the Medical Officer of Health is satisfied that the danger of spreading disease from such dairy or cowshed is over.

Removal of Infected Persons.—As a person suffering from an infectious disease is a source of danger to his neighbours it is necessary to have power to see that such person is so housed as to prevent the disease being spread from him to others.

Section 87 of the Ordinance gives power therefore to a Magistrate to order the removal to hospital of any person suffering from Plague, Cholera or Small-pox or other contagious or infectious disease if any duly qualified medical practitioner certifies that such person is without proper lodging, or living in a domestic building occupied by members of more than one family, or is on board any ship or vessel.

If people suffering from an infectious or contagious disease were to use public conveyances these might become contaminated and capable of giving the disease to other persons using the same conveyances afterwards. Section 88 of the Ordinance therefore makes it illegal for any one suffering from any such diseases to use a public conveyance and for any proprietor of a public conveyance to knowingly convey any such sick person in his conveyance.

Should any public conveyance have been so used it must be disinfected to the satisfaction of the Medical Officer of Health before it may be used again. A penalty of one hundred dollars may be inflicted on any one offending against this section of the Ordinance.

In addition to the powers conferred by Section 87 of this Ordinance there are others laid down in the bye-laws regulating the removal of patients. Of these, Bye-law 1 gives power to the Sanitary Board to provide for the removal of patients suffering from certain diseases to special hospitals appointed for the reception of such patients. It also provides that no patient shall be so removed except under the orders of the Board or of a legally qualified and registered medical practitioner and also that any such removal may only be carried out in such manner and with such precaution as the Medical Officer of Health may deem necessary.

Further this bye-law says that no such removal shall take place if a legally qualified and registered medical practitioner certifies that a patient is being lodged and cared for without danger to the Public Health.

It will be seen that under this bye-law provision is made for these removals to be done only by those who are trained to carry them out in the best way for the safety of the patient and their neighbours, and also that there is no absolute necessity to remove patients who may be treated in their own houses if a doctor is satisfied that this can be done with safety to the patient and his neighbours, or in other words if such patient can be properly isolated in his home so as to prevent the disease spreading to others and at the same time be properly cared for.

Again if a patient is certified by a doctor to be too ill to be removed this bye-law forbids his removal.

It is under this bye-law that small-pox patients are removed to the Chinese Small-pox Hospital and Chinese plague patients to one or other of the Chinese Plague Hospitals of which there are several in the City and Kowloon.

Most cases of plague are not very infectious and so hospitals to receive them need not be in isolated places as is necessary in the case of small-pox patients who are very infectious.

Nowadays the Board does not inflict the hardship of removing plague patients—except in cases of pneumonic plague which is very infectious—a great distance from their houses but sends them to one of the several hospitals in the City where under certain precautions they may be visited from time to time by their friends.

Bye-law 2 provides that people who have died from certain diseases may only be buried or removed for burial by the Officers acting for the Board. This is necessary to prevent the spread of infection through others, who do not know what precautions to take, handling the bodies.

But it also allows the friends of the dead person to conduct their burials under the permission of the Medical Officer of Health or the Secretary of the Sanitary Board.

This permission is always given provided that proper precautions are taken by the friends under the supervision of an Officer of the Sanitary Department.

Bye-law 3 gives power to the Medical Officer of Health to apply to the Magistrate for an order to remove a patient who is unwilling to be removed if the Medical Officer of Health finds that the patient is improperly lodged.

This is important both for the benefit of the patient himself and his neighbours or fellow lodgers.

Bye-law 4 orders that the Medical Officer of Health or other duly authorised officer of the Sanitary Department shall provide for the safe and convenient removal of a patient who is willing to be removed.

Bye-law 5 enumerates the diseases to which these bye-laws apply. These are as follows:—Plague, Cholera, Smallpox, Diphtheria, Scarlet Fever, Typhus Fever, Enteric Fever, Puerperal Fever, Relapsing Fever and such other diseases as may from time to time be defined by the Board by resolution.

Notification of Infectious Diseases.—In order to carry out measures for the prevention of the spread of infectious diseases it is necessary in the first place that the Sanitary Authorities should receive early information of all cases of such disease. This is provided for by the bye-laws of the Sanitary Board under the above heading.

The substance of these bye-laws is briefly as follows:— Bye-law 1.—If a legally qualified and registered medical man have a patient suffering from Plague, Cholera, Small-pox, Diphtheria, Scarlet Fever, Typhus Fever, Enteric Fever, Relapsing Fever or Puerperal Fever, he must notify the Medical Officer of Health of the name and address of the patient.

Bye-law 2 makes it the duty of the patient's relatives or friends or any person in whose house the patient is living or who has charge of or is attending on the patient to make the notification to the Medical Officer of Health or to the officer in charge of the nearest Police Station, if no legally qualified and registered medical man is attending the patient. But in this cases only the three following diseases are compulsorily notifiable, viz., Plague, Cholera and Small-pox.

Bye-law 5 makes it the duty of all persons who may know or suspect that a person is suffering from Plague, Cholera, or Small-pox or any other disease which may be notified for this purpose in the *Government Gazette*, to notify the officer on duty at the nearest Police Station or any officer of the Sanitary Department who must at once inform the Medical Officer of Health and who may in addition detain the suspected person or remove him to a hospital to be examined by a legally qualified and registered medical practitioner.

Disinfection of Infected Premises.—When an infectious person has been removed from any premises or has recovered from his illness or has died and the body has been removed, it becomes necessary to disinfect the premises so that other persons using them afterwards shall not be exposed to infection from the previous occupant.

Section 89 of the Ordinance gives power to the Sanitary Board to provide for such disinfection. In carrying out disinfection it may be sometimes necessary to destroy articles which may be contaminated.

If the friends of the sick person obey the laws about notifying infectious disease the Board will pay compensation for articles destroyed. This is what is meant in Section 89 by the sentence " Provided that where the case of infection has been *duly reported*............ reasonable compensation for property destroyed or damaged shall in such case be given."

For the due carrying out of the powers given by Section 89 the board has made bye-laws under the heading of disinfection of infected premises. Bye-law 1 defines the words epidemic, endemic, contagious, and infectious disease to mean and include Bubonic Plague, Cholera, Small-pox, Diphtheria, Scarlet Fever, Typhus Fever, Enteric Fever, Relapsing Fever, Puerperal Fever, and such other diseases as may from time to time be defined by the Board by resolution.

It also defines the expression infected premises to mean and include any premises in which any person suffering from any of these diseases is or has been recently located, and also any premises in which any animal infected with Bubonic Plague has been found.

So that premises will become infected premises in the eye of the law if a rat dead from plague is found therein.

Bye-law 2 orders the Medical Officer of Health to take such steps as he may deem necessary for the disinfection of any premises whenever any person suffering from any epidemic, endemic, contagious or infectious disease has been removed from such premises or has recovered or has died.

Bye-law 3 orders that all infected premises are to be thoroughly cleansed and disinfected to the satisfaction of the Medical Officer of Health immediately after the removal therefrom of the infected person or animal or the dead body.

Secondly this bye-law gives power to the Medical Officer of Health to detain the occupants of the premises or remove them to some place where they may be kept under supervision until the Medical Officer of Health is satisfied that they can safely be allowed to mix with the public again.

This precaution is necessary as it sometimes happens that one or more of the occupants of the premises might be infected with disease but as yet not show signs of illness, *i.e.*, he might be in the incubation stage of the disease and if allowed to go free at once might in a few days time be capable of infecting others.

Thirdly this bye-law makes it illegal for any person to reoccupy infected premises until they have been thoroughly cleansed and disinfected.

Fourthly this bye-law permits the inmates of the premises about to be disinfected to assist in or carry out entirely the disinfection if the Medical Officer of Health permits them to do so.

Fifthly this bye-law gives power to the Medical Officer of Health to order the removal and destruction, if he thinks such necessary, of partitions, screens, panellings, ceilings, lath and plaster or other hollow partition walls, etc., from infected premises. But compensation will be paid to the owners of such articles for damage done unless the structure or fitting removed or destroyed is proved to have been unlawfully erected or maintained.

Bye-law 4 orders that articles of clothing, bedding, etc., which are contaminated by reason of being in infected premises and which cannot be disinfected properly are to be destroyed and that compensation is to be made for such destruction.

Bye-law 5 orders that all contaminated articles of clothing, bedding, etc., which can be properly disinfected shall be so dealt with and returned to their owners, and also that no one but a duly authorised officer of the Sanitary Department may handle such clothing before it has been disinfected.

Prevention of Infectious Diseases.—It is not only necessary to remove patients suffering from infectious disease and to disinfect infected premises, but it is very important to systematically remove those conditions which are favourable to the breaking out or spread of disease, *e.g.*, dirt in houses, infestation of houses with rats and fleas, even when epidemic disease is not present in the Colony.

The general cleansing of houses and tenements which goes on all the year round in the Colony is an example of the work done with this object.

This work is regulated by the following bye-laws which appear under the heading "Prevention and Mitigation of Epidemic, Endemic, Contagious or Infectious Disease."

Bye-law 1 gives power to the Sanitary Board to order at any time a periodical cleansing of all premises in any district where the Board may consider this necessary. Further it orders that due notice of such cleansing be given to the occupants of the premises about to be cleansed and orders this work to be done by the staff of the Sanitary Department or by the inmates of the premises themselves. But if the inmates do this work they must do it under the supervision of an officer of the Sanitary Department and to the satisfaction of the Medical Officer of Health.

It is further ordered that all care shall be taken, while conducting the cleansing, to prevent unnecessary interference with business and that the inmates of the premises and their furniture shall not suffer from exposure to unfavourable weather.

Bye-law 2 gives power to the Board to declare that Epidemic, Endemic, Contagious or Infectious Disease exists in any district and to order that a special general cleansing and disinfection of that district shall be carried out under the direction of the Medical Officer of Health.

During such special cleansing the Medical Officer of Health may have any ceiling, screen, partition or panelling, lath and plaster or other hollow partition wall, etc., removed if necessary and for this compensation is to be paid to the owners of these things as under the Disinfection Bye-laws mentioned above.

It may happen that sometimes houses are unfit for human habitation and when this is certified to be the case by the Medical Officer of Health or any legally qualified and registered medical practitioner the Board has power under Bye-law 3 to order the enclosure of such houses, even although they may have been previously cleansed and disinfected, until such time as they have been made fit for human habitation.

No one may reoccupy such closed houses unless the Secretary to the Board certifies that they are again fit for habitation. To accommodate people turned out of such buildings the Board may provide other houses or shelters.

This has often been done in the Colony when houses are known to be infected with rats and therefore dangerous on account of the liability of the inhabitants to get plague from the rats. While the houses are closed the Board provides other houses for the people to live in.

Removal of Ceilings and Stair Linings.—Closely connected with the procedure governed by the above bye-laws is the matter of removing from houses all structures and fittings which can afford shelter to rats. Rats as is well known are very susceptible to plague and the disease spreads from them to men.

The bye-laws under this heading are therefore designed to remove this danger.

Bye-law 1 gives the Board power to define any district as an area within which all ceilings and stair linings must be removed upon one month's notice being given.

Bye-law 2 reserves to the Board power to grant exemption from or modification of the terms of the previous bye-law.

Bye-law 3 orders that the work of such removals shall be done by the Sanitary Department at its own expense and that the damage done in consequence shall be made good by the Department or that instead compensation shall be given such as the Board may think sufficient.

Mosquito Breeding Pools.—For many years now it has been known that certain diseases are spread through the bites of mosquitoes. The most commonly met with disease which is so spread is Malarial Fever. Mosquitoes lay their eggs in water and the first stage of life of these insects is spent in water. Hence it is important, especially in a tropical country, to take steps to prevent collections of water becoming breeding spots for mosquitoes, either by doing away with the pools or treating them frequently with oil, or covering them so that mosquitoes cannot reach the water.

A special bye-law exists to effect this and it says that when larvæ of mosquitoes are found on any premises the Board may on the advice of the Medical Officer of Health give notice to the owner to remove all accumulations of water from such premises or take steps to prevent the recurrence of the breeding of mosquitoes in such water. This notice must be complied with at once.

Domestic Cleanliness and Ventilation.—Bye-law 1 orders that the occupier of any domestic building shall always keep the building in a cleanly condition and shall see that drains, traps, gratings and waste pipes are kept unobstructed and in good order.

It also makes it the duty of the occupier to keep the windows and ventilating openings free from obstruction unless he be prevented from so doing by bad weather or the illness of any person living in the house.

Bye-law 2 gives the Board power to order the owner or occupier of a dirty building to cleanse and lime-wash it within a week of receiving notice so to do from the Board.

Bye-law 3 orders that the owners of all buildings which are occupied by members of more than one family shall thoroughly lime-wash such buildings once every year, and the times for such lime-washing are definitely stated in the bye-law according to the district in which the houses are situated. It however permits the Board to grant exemption from compliance with this bye-law and this exemption is often given, for example, when a house is found to be always kept in a cleanly condition.

Part III.

This part of the Ordinance is for the most part very technical but there are a few points which can be readily understood by every one and there are some, *e.g.*, the regulation for constructing rooms and cubicles which ought to be known to every householder.

Walls.—Section 100 of the Ordinance orders that all walls shall be built of brick, stone or other hard and incombustible substance and shall be solid across their entire thickness.

One of the chief objects of this is to ensure that walls are not hollow and so able to afford shelter to rats. It also affords protection against collapse of buildings and against the spread of fires.

Section 108 forbids the construction of lath and plaster or hollow walls except with the permission of the Building Authority.

Ground Surfaces.—Section 111 requires the ground surfaces of all domestic buildings to be covered with a good layer of concrete finished off smooth. This is in order to make the ground floors rat proof and to give a solid surface which will not become sodden with water and will not easily wear into hollows and collect dirt but which may be easily kept clean. In addition this section requires the ground surfaces of such places as yards, kitchens, basements, privies, areas, stables, cowsheds, etc., to be finished off smooth with cement, granite paving or glazed bricks or tiles. This is necessary in order to enable such places to be kept clean in spite of the fact that they are always liable to become soiled from time to time with dirty fluids.

Section 112 gives power to the Building Authority to order proper repairs to be made to such ground surfaces as are dealt with in the preceding section when from wear and tear or other causes they no longer comply with the requirements of the preceding section.

Verandahs.—Under certain circumstances these structures are allowed to be erected over public streets, *i.e.*, on land which does not belong to the owner of the house on to which the verandah is built.

These structures have the effect of keeping off the glare of sunshine and the beat of heavy rain from the dwelling rooms and they enable people to keep their windows open when otherwise they could not do so. They also make places where people can sit outside their actual houses during the very hot weather.

If, however, people enclose these verandahs or obstruct them with furniture or merchandise they at once do away with the useful effect of such structures.

Section 139 therefore makes it illegal to obstruct or enclose wholly or partially any such verandah and forbids people to use it as a bath room, store room, urinal, water-closet, sleeping apartment or kitchen.

Kitchens.—It is important that places where food is cooked be kept clean. In order that this may be done it is necessary that the floors of kitchens and their walls be made of material which will not absorb water or filth. Also it is very important in a place where kitchens are built one over the other in buildings of several storeys that kitchen floors do not leak and allow dirty water to fall through into the kitchen below.

Section 140 therefore orders that all kitchens shall have floors of cement concrete or other non-absorbent material and that their walls shall be covered with a layer of cement mortar one inch thick to a height of four feet from their floors.

Windows, Cubicles and Rooms.—Owing to the shape of most of the houses in the Colony inhabited by Chinese it is found impossible to erect private sleeping places in floors so that each one has its own window.

When such a sleeping place does have its own window, and this window is sufficient, the law calls this sleeping place a *Room.* When, however, the window is not sufficient the sleeping place is called a *Cubicle.* For a window to be sufficient it must have an area equal to one-tenth of the floor area of the sleeping place and one-half at least of the window must be glazed and one-half at least must be made so that it can be opened. In addition to this it is necessary for the window to face an open space of sufficient size so that it may open on to what is allowed to count as *External Air.* If a window, for example, only faces a narrow lane say of eight feet in width then this window is insufficient to allow the sleeping place being classed as room. The necessary least measurements of the space into which the window must open are as follows: The space must measure thirteen feet in a straight line out from the window and must be five feet wide throughout and there must be no obstruction whatever over the area so measured out.

As verandahs and balconies offer obstruction to the light which can enter windows, the above measurements, when such structures exist, must be made in the space beyond the verandah.

Now, when the window area of a dwelling or sleeping place is sufficient as above described, this place is a *room* and in it it is permissible to erect one cubicle at least, and if in addition there is a window opening into the external air in the rear of the room it is permissible to erect another cubicle therein.

No more than two cubicles may be erected in any room.

If therefore the tenants of a floor in a Chinese house require more sleeping places than these one or two cubicles they should look out for a floor which has many windows round which they could erect rooms or else look out for a top floor which has skylights, as skylights, if of sufficient size and properly glazed and made to open, count as windows.

The law with regard to cubicles is not quite strictly enforced and the Sanitary Board gives permission for more than the number of cubicles allowed by the foregoing regulation to exist in floors which, after inspection, it considers sufficiently well lit and ventilated to contain extra cubicles without making the floor too dark for the health of the tenants.

The Board's permission for these extra cubicles must, however, be always obtained before their erection.